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Robert N. Spengler III  
*Editors*

# Mobility and Ancient Society in Asia and the Americas

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Proceedings of the Second International Conference  
on “Great Migrations” Held at Columbia University  
in December 1-2, 2011



Michael David Frachetti • Robert N. Spengler III  
Editors

# Mobility and Ancient Society in Asia and the Americas



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ISBN 978-3-319-15137-3      ISBN 978-3-319-15138-0 (eBook)  
DOI 10.1007/978-3-319-15138-0

Library of Congress Control Number: 2015941310

Springer Cham Heidelberg New York Dordrecht London  
© Springer International Publishing Switzerland 2015

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# Foreword

The first International Conference on Great Human Migrations took place in Paris in 2008. The main topic of that conference was the movement of human beings out of Africa and their subsequent spread all over the planet. The subject of the second conference—held in New York City from December 1 to 3, 2011—was the prehistoric settlement of the Americas and the relationship between prehistoric societies of the Americas and those of Inner and northeastern Asia.

The subject of the current “Conference Proceedings” volume is very close to us as Kazakhs, as a society with a rich history of nomadism. Traveling is in our blood, in our genes. While today we are a modern, globalized nation, we embrace our identity of nomadism, both socially and historically. Our history is tied to great nomadic migrations, which may provide one reason for why we are happy that the second International Conference has brought together an array of world scientists from various fields (archaeology, anthropology, genetics, and linguistics) to address the issue of migration in both Asia and the Americas. At the conference, many countries were represented including Kazakhstan, the USA, Azerbaijan, Germany, Chile, Argentina, Russia, Belgium, the UK, Denmark, and Brazil. This spirit of international collaboration is carried into the publication of select papers from the conference, presented in the current volume. The selected papers in this volume cover these and other topics through a diversity of scholarly approaches that bring us closer to understanding ancient adaptive, organizational, linguistic, and genetic relationships between prehistoric Asia and the Americas. While the focus of the chapters is the Paleolithic period of transcontinental migration, the theme of Asian-American connection seems appropriately relevant today, in light of globalization and international diplomacy. I would like to take this opportunity to briefly introduce the ways in which the modern Republic of Kazakhstan is making strides to bridge Asia and the Americas today.

When Kazakhstan gained its independence from the Soviet Union 24 years ago, the urgent need was for jobs and economic development. We needed to provide a future for our people. We have done that. Kazakhstan is now—according to the World Bank—an upper-middle-income nation. We have built schools, universities, hospitals, highways, and even a new capital city, Astana.

As we celebrate our independence every year, we, of course, look back with pride at what we have achieved, but we must also look to the future. We have studied democracies around the world and we have seen that they work best in nations that have a strong and thriving middle class and an educated population. We didn’t have that in 1991, but we do now. This, and the development of political and civil society institutions, represents another step forward in our political development, guaranteeing a more pluralistic political system.

This has been made possible thanks to the support we have received from our key friends and partners. The United States played a pivotal role in supporting our independence and economic prosperity.

Kazakhstan is determined to press on with its economic and political development. We are convinced that our recent elections have introduced a more diverse parliamentary constituency, creating a healthier and more robust political system that will ensure Kazakhstan's long-term stability and prosperity.

We have also been playing a growing role in developing connections across Eurasia, logistically, economically, culturally, and politically. Kazakhstan participates in creating a Western Europe—Western China highway, builds railway connections with countries both east and west, sponsors a regular dialog among leaders of all of the world's major religions, pursues a Green Bridge initiative promoting environmentally friendly economic growth, and promotes economic integration in Eurasia through various organizations. Two more initiatives show that our country increasingly wants to bring an even bigger contribution to the global good: the hosting of the international specialized exhibition EXPO 2017 in Astana dedicated to the theme of Future Energy and Kazakhstan's bid to become a non-permanent member of the UN Security Council in 2017–2018. Kazakhstan has, thus, truly become the heart of Eurasia and a land bridge bringing nations in the region and globally closer together in every sense of the word.

The fact that Kazakhstan has co-organized such a significant International Conference is also indicative of the importance it attaches to science, international cooperation, and progress.

I would like to take this opportunity to express special thanks to Dr. Alan Timberlake, Director of the Institute of East Central Europe, at Columbia University, who worked tirelessly to help organize the conference on the ground in New York. I also would like to thank Dr. Michael Frachetti and Dr. Robert Spengler from Washington University in St. Louis, for co-organizing and co-editing the proceedings volume, allowing for the ideas of the conference to be shared with the wider academic community and public. This volume reflects our goal to highlight Kazakhstan's contribution to international scientific and historical inquiry of global relevance, and the broader ambition to bridge scholarly traditions across Eurasia and the Americas.

Astana, Kazakhstan

Erlan Idrissov  
Minister of Foreign Affairs  
Republic of Kazakhstan

# Acknowledgments

The second international conference on “Great Migrations” was hosted for 3 days by Columbia University from November 30 to December 2nd, 2011, co-organized by the Embassy of the Republic of Kazakhstan and the Harriman Institute at Columbia University. First and foremost, we want to thank His Excellency Minister Erlan Idrissov for his sponsorship and intellectual curiosity that was the force behind the conference and which made these proceedings possible; he also graciously provided the foreword for this volume. We also would like to thank the current Ambassador of the Republic of Kazakhstan His Excellency Kairat Umarov for continued interest and support of this project. Key individuals from the Kazakh Embassy, namely Nurgali Arystanov have gone to great lengths to follow up with the production of this volume and were instrumental in promoting the connections that brought an international community of scholars together for the conference and to contribute to the volume. We would also like to especially thank Professor Alan Timberlake, the Director of the Harriman Institute and acknowledge the many individuals from Columbia University who contributed to the planning and success of the conference in New York City. We also thank all the participants of the conference including the 19 authors who collectively contributed the 12 chapters here. While these chapters are just a selection of the total lineup of presentations given at the conference, all of those in attendance were instrumental in shaping the lively and productive exchange of ideas that are the foundation for the chapters that follow.



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## About the Editors

**Dr. Michael David Frachetti** is Associate Professor at Washington University in St. Louis. The main focus of his research is on the dynamic strategies of pastoral nomadic societies living in the steppe region, mountains, and deserts of Central and Eastern Eurasia. His work centers primarily on pastoralism in the Bronze Age, which is intricately tied to questions of social and economic interaction between regional populations across Central Asia at that time. His theoretical interests center on how social groups utilize economic and political strategies to communicate inter-regionally and formed wide reaching networks as early as 2000 BC (the Mid-Bronze Age). He also studies the relationships between pastoral strategies and the environment, investigating how mobile groups contributed to new economic adaptations. He is the author of *Pastoralist Landscapes and Social Interaction in Bronze Age Eurasia* (UCPress, 2008). He currently conducts field research in Eastern Kazakhstan and Uzbekistan.

**Dr. Robert N. Spengler III** is a research associate at Washington University in St. Louis, and he currently holds a Volkswagen and Mellon Foundations postdoctoral fellowship for research at the German Archaeological Institute in Berlin, Germany. He is using macrobotanical methods to study developments in early Inner Asian economy, specifically looking at trajectories of agricultural spread and adoption. Using archaeobotanical material from sites across Inner Asia, he is mapping out the chronology for the spread of specific domesticated crops. He is interested in understanding the dynamics between the paleoenvironment, cultural exchange, and social orders in the arid and mountainous zones of Central Asia and western China. These questions feed into a broader understanding of human adaptations, social development, and complexity, while building a new view of the development of complex societies and the role of agricultural intensification.

# Chapter 1

## Introduction

Michael David Frachetti and Robert N. Spengler III

### 1.1 Introduction

Anatomically modern humans moved out of the African continent sometime between 125,000 and 60,000 years ago<sup>1</sup> and into southwest Asia; they populated most of the Old World by at least 40,000 years ago (Macaulay et al. 2005; Mellars 2006; Lahr 1995). It took them over 20,000 more years to reach the landmasses of North and South America. Marking data points on a map, the apparent pathway of this vast human campaign seems relatively obvious. The simplified Out of Africa “TripTik” might read as follows: start in the Horn of Africa, head continuously north (-east and -west) for roughly 60,000 years (in order to populate present day Europe, Central Asia, and East Asia). Then move continuously east for another 20,000 years into northeast Asia. When you see the ice-free land-bridge, cross it (or paddle along its edge), your destination will be to the south. As anecdotal as this sounds, the narrative of the most ancient human migrations often seem so neatly packaged, that academics forget to communicate that 40,000 years reflects roughly 1,500 generations of people, each reconnoitering the road map as they made their way in the world. Archaeological evidence today demonstrates the fact that well-adapted and socially organized people arrived in the New World eventually, but details of who they were, how they came, and when they reached certain areas, remain among some of the most compelling questions about of ancient humanity.

This book is a collection of essays by leading international scholars concerning the character, timing, and geography of regional migrations that led to the dispersal of human societies from Inner and northeast Asia to the New World in the Late Pleistocene (ca. 20,000–15,000 years ago). The chapters consider the trajectories, ecology, and social dynamics of ancient mobility, communication, and adaptation in both Eurasia and the Americas, using diverse methodologies of data recovery ranging from archaeology, historical linguistics, ancient DNA, human osteology, and paleoenvironmental reconstruction. Although methodologically diverse, the chapters are each broadly synthetic in nature and present current scholarly views relating to when, and in which ways, societies from northeast Asia ultimately spread eastward (and eventually southward) into North and South America, and how we might reconstruct the cultures and adaptations related to Paleolithic groups of these regions.

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<sup>1</sup>The exact dates for early modern human migrations out of Africa are still debated and several unsuccessful colonization waves may have preceded. Considerable literature exists discussing the Out of Africa model or the Recent African Origin model; see Mellars (2006).

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The chapters in this volume arose from a 3-day international conference co-organized by the Embassy of the Republic of Kazakhstan and the Harriman Institute at Columbia University. Funding was provided by the Embassy of Kazakhstan. The 12 chapters included in the book reflect a subset of the roughly 20 presentations made during the meeting, with primary coverage of the major themes, methodologies, and scholarly approaches presented. This was the second international conference on “Great Migrations” spearheaded by the Government of Kazakhstan; the Minister of Foreign Affairs, His Excellency Erlan Idrissov, has kindly written the forward to this volume.

Scholars and specialists from countries around the world were invited to New York City to present their current research and engage in cross-disciplinary dialogue about the core issues of human mobility and long-term processes that connected ancient societies of Inner and northeast Asia and those of North and South America. Given the interdisciplinary forum, the authors were prompted to present their specific scientific findings in light of larger issues of ancient intercontinental migration. Thus, the chapters are both synthetic and specific in their presentation of contemporary research.

This volume bridges scholarly traditions from Europe, Central Asia, and North and South America, linking different perspectives into a common view. As such we have organized this book to present an international overview of a problem that is relevant to the ancient history of both Eurasia and the Americas. The content of the chapters provides both geographic and conceptual coverage of main currents in contemporary scholarly research, including case studies from Inner Asia (Kazakhstan), southwest Siberia, northeast Siberia, and North and South America. The order of chapters follows a geographic pattern that corresponds with the current understanding of the direction of ancient population migration in prehistory.

Highlighted in the title, concepts of migration take center stage in this volume and migration models underpin many of the chapters. Since migration held a strong explanatory role in the Soviet academic tradition, it also heavily influenced subsequent interpretations of the archaeological record and continues to shape debates about Paleolithic society in northeast Asia. Migration concepts (as they relate to both Asia and the Americas) are, therefore, addressed early in chapters by both Frachetti (Chap. 2) and Taymagambetov (Chap. 3). The subsequent chapters layout various lines of evidence, approaching migration as a macro-phenomenon that is the product of more accountable human strategies and adaptations, such as mobility, technological progress, and linguistic and social hybridization (e.g., kinship). The book also addresses the genetic evidence in a chapter by Schurr, which moves beyond “founders effect” models to understand how complex social interactions, multi-directional genetic exchanges, and subsequent population admixture contributed to the populations of northeastern and Inner Asia as well as the Americas.

Ultimately, this book provides a synthetic perspective that bridges Asia and the Americas and brings the ancient evidence from both sides of the Bering Strait into common focus.

## 1.2 Great Migration(s) from Asia to the Americas

Chapter 1 begins with a consideration of migration and mobility within an archaeologically tangible context from later prehistory (and ethnography). An analogy is drawn between the mobility routines of Bronze Age nomads—namely mobile mountain pastoralists of southeastern Kazakhstan (ca. 5,000–4,000 BP; Frachetti 2011)—and those of more ancient Inner Asians and trans-Beringians. Migration is presented as the cumulative result of strategic mobility, niche construction, and reconfigurations of social structure (also Spengler 2014). Mobility is distinguished as flexible and multi-causal, thus historically situated. The issue of how to extract the functional historicity of mobility from a considerably ancient prehistoric (rather than a-historic) archaeological archive is taken as a challenge, thereby setting the stage for the following chapters, which deal more specifically with evidence from the field.

Taymagambetov focuses on the Paleolithic establishment of people in northern Central Asia, noting that remains from the Obi-Rahmat Cave in Uzbekistan date to over 50,000 years ago. Although heavy loess build up and dense colluvial deposits have obscured much of the early human record from this part of the world. Taymagambetov further synthesizes the Upper Paleolithic evidence for human migrations into North Asia. He emphasizes the fact that a better understanding of the Paleolithic occupation of Kamchatka and Chukotka in Siberia is necessary to fully understand the movement of peoples into North America.

Schurr (Chap. 4) provides a deeper insight into the role North Asians played in the early wave of human occupation into the far northeast of Asia. He notes, based on genetic evidence, that the population of people who occupied the northeast corner of Asia after 25,000 years ago originated in the Altai-Sayan region of southern Siberia. He further notes that subsequent waves of people out of this region played a role in the Mongolian and Turkic expansions of the past couple 1,000 years.

While most scholars agree that the earliest pioneers came to the Americas sometime between 17,000 and 13,000 years BP, these dates are still not secure, and researchers are continually trying to refine the dates down to a narrower, yet also more widely agreed upon range. As Nichols (Chap. 9) points out, linguistic clock data, for example, continually suggests older dates for the initial habitation. Politis et al. (Chap. 7) synthesize the scant archaeological data from North America that may tentatively point to an older date, noting that the dates presented for certain sites, from just before the LGM, should not be dismissed outright without further research. It is now clear that these earliest immigrants colonized the New World before the establishment of a Clovis toolkit; an innovative lithic technology that helped rapidly spread an increasingly denser population of humans to all corners of the Americas by 13,000 BP. In addition, as Ershova (Chap. 11) and others in this volume point out, these early explorers managed the new frontier during one of the harshest periods for modern humans in the far northern hemisphere.

While Clovis points are not associated with the earliest colonists of the Americas, Erlandson and Braje (Chap. 5) note that understanding the development and spread of this lithic culture can shed light onto the lacuna of material culture from earlier periods. The past 16,000 years has seen immense landscape changes around the Pacific Rim, including glacial retreats, tectonic shifts, sea level rise, fluvial and coastal erosion, and the reestablishment of a vegetation community on barren post-glacial land. As a result much of the archaeological evidence for early human migration has been erased from the far northwestern parts of North America, including the proposed ice-free corridors of both the coastal or interior routes. Erlandson and Braje attempt to bypass this gap in data by linking stemmed point technology in northeastern Asia to similar forms along the Pacific coast of the Americas. They map out, what they call a “discontinuous trail of stemmed points extending from Japan and Kamchatka, through western North America, to the Andean Coast and the Amazon Basin” (Chap. 5).

As the debate over when the earliest Asians made it to North America continues, other researchers have focused their discussions on how many founder populations there were and whether there was more than one migratory wave. Hubbe et al. (Chap. 8) argue that morphologically the earliest migrants seem to share a similar ancestry; they further argue, however, that the level of variation in morphology of later populations suggests that more than one dispersion brought humans from Northeast Asia. While Hubbe et al. do not exclude the possibility for a continual flow of genetic material through Beringia, they favor a dual-wave model. Dixon also supports the idea of multiple waves of migration, noting that the Americas were populated before the opening of an ice-free or deglaciated corridor in Beringia. He supports the possibility of an early route along the Pacific Rim, suggesting that lithic technology moved north, into the ice-free zone from interior North America as the glaciers retreated, implying that Asian groups had colonized North America from the coast before the ice-free land corridor theoretically opened. He ultimately notes that the colonization process may have taken thousands of years and involved multiple waves from different areas.

Politis et al. summarize the existing data for the colonization of the Americas, focusing on South America. While they agree that the earliest people in South America came through North America from a LGM frozen north, several early sites in South America are providing clues to the process of establishing a human population across the two joined continents. With the general acceptance of Monte Verde in the south of Chile as older than 13,000 year BP (Dillehay 1989, 1997) and a growing number of accompanying sites across South America with similar dates, it is clear that people rapidly spread south. There is a general lack of pre-Clovis archaeological sites from the southern parts of North America; however, as Politis and his colleagues point out, this gap in data can be filled in by focusing on the South American sites.

Anderson (Chap. 6) further compiles the growing clues for timing and routes of migration to the New World; he then goes further and discusses the initial movement of peoples inland. As Anderson, Politis, and their colleagues point out, the early pioneers quickly moved south along the Pacific Rim and rapidly established in South America. However, the movement of people into the interior of the North American landmass was a new obstacle. The extraction of coastal resources (e.g. forage, fish, animals) would have required a unique skillset from that required to feed colonizing populations on the freshly deglaciated grasslands of North America. Fluted points may have helped facilitate this process. Anderson suggests that the original treks inland may have taken a “leap-frog” movement, whereas forager/hunters may have moved between resource-rich ecological pockets.

Other researchers have discussed similar mobility patterns among later Asian populations, whereas movements are focused on resource-rich pockets or ecological nodes in a reticulated pattern of movements, in some cases jumping long distances across a broad matrix of grass (see Spengler et al. 2013). These “staging areas” would have been along coastal zones, lake shores, or river ways where biodiversity was highest and resources were more abundant. Cases studies from prehistoric Central Asian mobile pastoralists present an economic model focused on biodiverse and biologically dense ecotopes within an otherwise vast matrix of grasslands. Using a parallel economic model to study the first immigrants to explore the American continents, we can envision an overall low population density with groups densely clustered in specific well-known loci on the post-glacial steppe landscape. Populations would function as if they were denser than they actually were—kin groups would periodically reconnect at these resource hotspots and then disperse again over great distances for foraging and hunting, possibly following migratory routes of birds and megafauna, while also keeping a mental tab on seasonality of wild fruits, nuts, and root foods. A long-distance mobile economy would have been further facilitated by the cultivation of domestic dogs (*Canis lupus* ssp. *familiaris*), a fast self-transporting, hardy, and versatile food source, and eventually with bottle gourds (*Lagenaria siceraria*), although the exact timing and route of origin of New World bottle gourds is still in debate. In this sense, paleoeconomy becomes the key for understanding the motivating factors for and process of human expansion.

The earliest anatomically modern humans to reach East Asia likely took a coastal route along the shores of South Asia (Macaulay et al. 2005; Mellars 2006; Lahr 1995). These humans may have had a diverse diet and were economy adapted to a littoral lifestyle; this is significant when we consider the possibility that the earliest pioneers into North America may have followed a coastal route and their descendants may have continued following the coast south all the way to the tip of South America in just a couple millennia. These explorers may have followed the migration of sea birds, the spawning of salmon in coastal estuaries, and trailed the movements of large marine mammals, like sea lions and seals. They likely also followed the coasts in search of new tidal beds for harvesting abalone, limpets, mussels, oysters, various crabs, and small fish—easily collected in tidal pools. There would have also been a wide range of easily collected plant resources, most notably kelp and other seaweeds. The resource-rich coasts would have allowed humans to spread rapidly to South America without thinning their population beyond reproductive capacity or losing contact with neighbor kin groups back up the coast. As has been pointed out throughout this volume, these early coastal sites would have been submerged with the rising sea levels, erasing the first few millennia of human expansion

into the New World. It was not until the adoption of a Clovis toolkit that explorers ventured permanently inland and occupied the entirety of the continent. The retreating glacial moraines and loess plains of North America were rapidly established by herb and grass steppes<sup>2</sup> and humans followed river ways, jumped between lakes and wetlands, and focused on resource-dense pockets across a broad expansive grassland. In this sense the popular image of early American settlers sweeping across North America and pillaging immense herds of megafauna gives way to small groups walking or paddling along rocky frozen coasts collecting clams and seaweed.

The Clovis period leap-frog migration model, across interior North America, is also discussed by Ives (Chap. 10). Ives focuses on kinship among these early colonists; he argues that it would have been imperative to maintain a large enough population of suitors or a marriage pool for young people to reproduce while also following social norms in mate selection (e.g., avoiding sibling taboos). He suggests that human reproductive rates among hunter/gatherer peoples limit the distance small bands will move into *terra incognita* without clear links back to known bands where marriage partners can be obtained. While most researchers are focusing on the timing and directions of migrations into the New World, Ives takes a step forward and discussed models of kinship structure and marriage practices among these groups.

### 1.3 Conclusion

This book represents the proceedings from an international conference of scholars presenting new data sets and diverse synthetic perspectives on migration. The chapters cover a range of topics from mobility in Asia to the earliest peopling of the Americas. This volume does not just deal with the early spread of people across Beringia, it also deals with human spread within and across North and South America. The demographic growth and diffusion of people to all corners of the Americas is less commonly addressed in the same volume as discussions of the earliest immigrants to live in, and migrate from, Siberia to North America.

In addition to being a compendium of current research, this volume deals with several novel topics of research that are either underrepresented academically or have rarely been approached in the way that these authors do. For example, the chapter by Nichols uses the most recent view on linguistic clock data, from a global scale, to map out the timing of the human spread into the Americas. Erlandson and Braje link humans on both sides of the Pacific Ocean by stemmed points, and trace pre-Clovis lithic technologies back to Asia. Ives looks at kinship structure among the earliest Asian explorers in the Americas, a topic almost completely neglected by academic investigation. Hence, the volume not only links researchers working in the Old and New Worlds, but it also presents a new conceptual framework for addressing global interactions in deep antiquity while bridging multidisciplinary methods and international academic traditions.

Finally, the afterword is provided by Mr. Olzhas Suleimenov—a published poet, environmental advocate, and Ambassador of Kazakhstan to UNESCO (2001–2014). Suleimenov both contextualizes the past goals of the Great Migrations conference series and outlines the plans for the third gathering of scholars, anticipated as the next conference to be held soon. He also provides a bold and wide-ranging theoretical paradigm which he provocatively calls the “Third-Wave” of Great Migrations. In his synthesis he strives to relate the symbolic, linguistic, and ideological roots of diverse global civilizations, across time and territory. His analysis, while potentially unorthodox from the canonical

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<sup>2</sup>The retreating of glaciers in the mountains of the world today can serve as a loose indicator of how fast plants and animals colonize recently deglaciated land—in the case of the Tien Shan and Dzhungar in Central Asia herbaceous plants establish in as little as 10–20 years (personal observations).

academic view, challenges us to explore the possibility of global social linkages that bridge Asia, Europe, and even the New World over the course of millennia.

The volume represents expertise from half a dozen different countries and over a dozen different research institutes. The collective contribution of these authors provides valuable insight and a vital contribution to growing areas of interest in the social and biological sciences, most specifically in archaeology.

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## Chapter 2

# Nomadic Mobility, Migration, and Environmental Pressure in Eurasian Prehistory

Michael David Frachetti

### 2.1 Introduction

What factors shaped prehistoric mobility and how did ancient mobility—over long and short scales—contribute to population dispersals (migrations) across the world? While clinal patterns of regional population genetics and linguistics are recognizable, our ability to leverage ancient archaeological evidence to illustrate concrete migration processes is one of the most compelling, yet difficult, concerns for scientists today (for discussion, Frachetti 2011). This volume is concerned primarily with understanding the migratory history that linked Inner and northeastern Asia across the Bering Strait to North and South America nearly 15,000 years ago. As the chapters in the volume illustrate, there is an evident pattern of demographic displacement that defines a clear relationships between the earliest settlers in North America and antecedent populations of prehistoric hunters of the Siberian arctic. While many details of the mobility and settlement ecology of the Americas remain elusive to scientific recovery, analogies from later prehistoric archaeology allow us to relate the apparent pattern of migration that emerges at the large scale to the evident practicalities of mobility at the local scale.

In this chapter I explore the relationship between community mobility as a local-scale practice and migration as a long-term process, through an examination of Eurasian mobile pastoralists of the Middle Holocene (ca. 5,000–4,000 years BP). The goal of investigating later prehistoric mobile societies in light of their strategic use of mobility is to understand the relationship between social and ecological forces and their influence on the formation of social landscapes, or cultural perceptions and practical constructions of socio-ecological contexts that shape behavior, interaction, and social organization. Such a concern is relevant for understanding migratory processes generally and provides an analogue between patterns of Bronze Age mobility and those that occurred millennia before between Siberia and North America among regional hunters.

Of course, there are significant differences when comparing Pleistocene hunter-foragers from Siberia and North America to Bronze Age pastoralist populations of Central Eurasia. The mobility of Bronze Age pastoralists was largely dictated by the needs of domesticated animals like sheep, goat, and cattle, rather than the movements and herd structures of wild game. Yet given the historical relationship between these two modes of social economy, the question at hand is: what factors shape the travel of mobile groups (e.g., social, ecological, and environmental resources) and how do mobile groups make decisions about the extent and frequency of their mobility? By examining these

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relationships in both specific and general terms, I hope to contribute to our understanding of mobility among Pleistocene hunting groups and how their practices might have shaped wider-scale migratory processes leading to the peopling of the new world.

## 2.2 Mobility vs. Migration

The first important distinction to make is between the terms mobility and migration. Here, I use the term mobility to refer to geographic travel and more specifically the strategic movement of groups on a regular or prescribed schedule to capitalize on diverse resources (whether practical, political, ideological) to meet and interact with others, to make religious pilgrimages, or to explore a new environment. Numerous ethnographic cases from Africa, Eurasia, and the Americas provide examples of seasonally mobile communities whose annual travels take them between various home territories on regular and predictable schedules. Mountain pastoralists of Eurasia, such as those discussed below, typically spent wintertime in the lowlands in discrete environmental zones where resources are available and, in the summer, traveled to the highlands where wild pasture resources are commonly more abundant (Frachetti 2008b).

Since seasonal mobility patterns are established according to regionally specific environmental conditions as well as socio-political concerns, it is not enough to say the environment alone dictates seasonal mobility. One has to consider the broader spectrum of parameters that shape particular patterns of mobility (e.g., Barth 1966). Furthermore, mobility patterns can vary highly from year to year, and groups may be traced across diverse environments such as deserts, mountains, and forests. The diversity and contingency of annual and seasonal mobility patterns is especially relevant when discussing hunting and gathering communities as well as pastoral nomads (Ingold 2000).

Migration, as defined here, refers to directed, territorial (transregional) relocations that result in populations changing the epicenter of their practical (localized) mobility orbits—i.e., changing their “home territory.” The scalar and cartesian distinction between mobility and migration is important because migration is sometimes used to refer to cyclical movement from place to place as well (Khazanov 1994). Limiting the term “migration” to population displacement events distinguishes trajectories of demographic relocation from regional cycles of demographic oscillation. Of course, mobility can inculcate migration, or contribute to the process. Thus, it is at the point of intersection of these phenomena that we can envision processes of environmental learning, the development of novel strategies and adaptive innovations, and the transformation of social structures to accommodate new regional contexts, social partnerships, and resources (Zvelebil 1986).

## 2.3 Mobility and “Migration” Among Bronze Age Eurasian Pastoralists

Pastoralist communities of the steppe region of Central and Inner Eurasia developed different forms of specialized herding economies in different regions, from ca. 5,500 to 3,000 years BP. By 5,000 BP, mobile herders, many of whom existed alongside (and sometimes integrated with) farming communities and hunter/gatherers exploited most regions of Central and Northern Eurasia. Pastoralist communities of Eurasia provide an informative case study for understanding the practicalities of mobility and its relationship with migration—as defined above. In addition, the archaeology of these groups demands that we reassess the relationship between extractive and productive economies, mobility, and the anthropogenic development of specialized ecological settings. For mobile herders, seasonal changes in pasture have been shown to stimulate the growth and regeneration of rich microenvironments within otherwise semi-arid or soil-poor ecotones (Spengler et al. 2014). Such parameters of

“niche-construction” might have helped reduce the need to migrate long distances. Less well documented is the degree to which hunting and foraging communities shaped their resource catchments in early prehistory, and this may be a differentiating factor for understanding motivations for migration in the Late Pleistocene (but see Rowley-Conwy and Layton 2011).

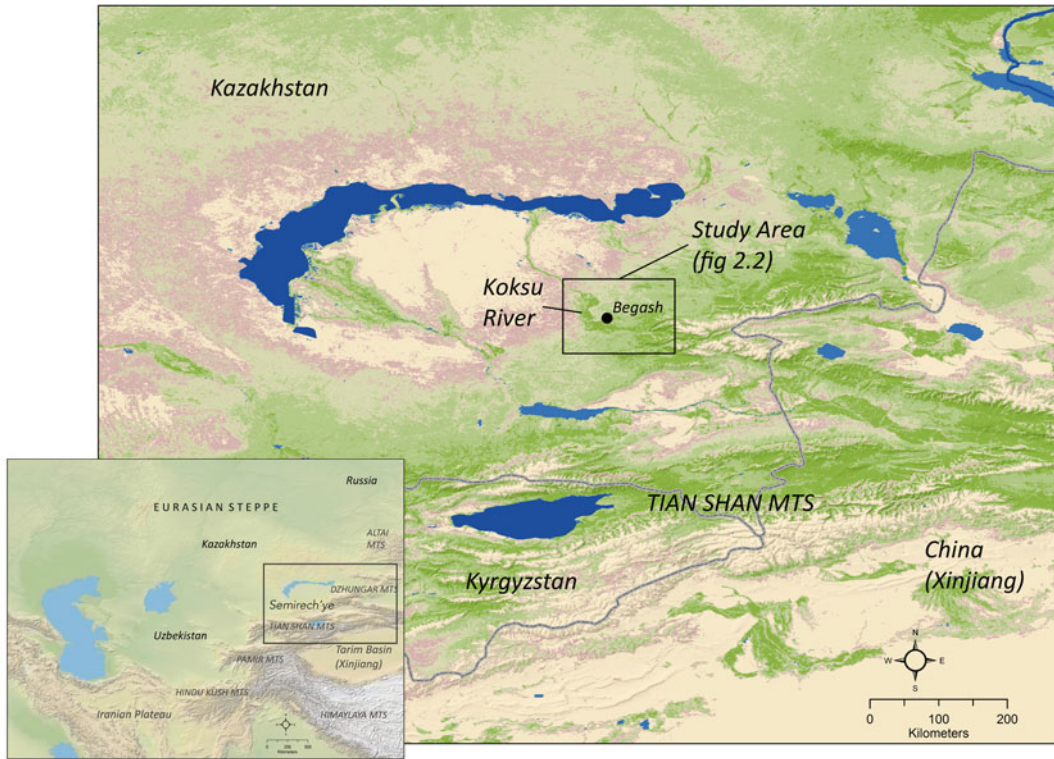
The canonical view of the earliest pastoralist communities in Central Eurasia is that their economy first emerged around 5,000 years ago in association with agricultural communities in the Black Sea region, effectively the steppe territory of western Eurasia. The model suggests that as they relied increasingly on mobility to support herding, these communities migrated eastward, crossing the steppe in sequential waves of regional demographic displacement 5–6,000 years ago, (Anthony 2007; Khazanov 1994). Supporting arguments for this proposed migration have typically derived from stylistic associations between regional material assemblages, namely similarities in ceramic decorations between societies of the west and supposedly later, similarly styled materials of east Eurasian communities. For decades, this “ethno-genetic” model has been used to explain the apparent migration of mobile communities and illustrate the diffusion of materials across the Eurasian steppe.

Recent in depth analysis of ceramic chronology and productive technology has convincingly illustrated that significant localized traditions of pottery manufacturing existed that predate Bronze Age migrations and continue into the period when “new” stylistic diffusions supposedly occurred (Doumani 2014). Paula Doumani’s Ph.D. thesis, which involved the analysis of thousands of ceramics in eastern Kazakhstan, challenges the typological associations that underlie major archaeological material assemblages that define regional variations of the “Andronovo Cultural Community.” Document work problematizes models of large-scale demographic migration as well, which allegedly sparked new domestic strategies and population shifts across the steppe region (also see Frachetti and Rouse 2012 for discussion). Furthermore, the idea of early Eurasian pastoralists moving eastward across the steppe in waves some 5,000 years ago must also be reconciled with basic facts about the absolute chronology of regional populations and the long-standing patterns of mobility evident in specific regions (cf. Anthony 2007).

The fact remains that nomadic pastoralists, especially those living in mountainous regions of Semirech’ye (Fig. 2.1), relied on relatively localized (ca. 10–40 km) seasonal mobility orbits to manage domesticated herds, which served as their primary basis of subsistence and socio-political economy. Ethnographically documented patterns of mobility recorded about eighteenth and nineteenth century Kazakh nomads in the open steppe zones depict longitudinal seasonal migrations of various distances ranging from 10 to 15 km up to hundreds of kilometers, mainly oriented North/South (Abramzon 1971). Thus both archaeology and ethnography reveal regular, seasonal oscillations rather than cumulative and sequential events of group displacement. Interestingly, little evidence exists among ancient and historical pastoralists of east to west mobility. In other words, the mobility patterns that operate at the scale of populations actually exploiting their Eurasian grassland environments were fairly regional or local, and brought populations back and forth repeatedly and only minimally shifted homeland territories (Fig. 2.1).

In many cases, environmental distribution affects this directionality. In territories like southeastern Kazakhstan defined by mountainous terrain, the distance between summer and winter pasture are short and elevation and associated pasture resources in the mountains largely impacts seasonality. From at least 5,000 years BP, pastoralist mobility was defined by transhumance, wherein populations traveled up and down the mountains rather than across vast distances. On the basis of the current prehistoric record from the steppe, pastoralist mobility was likely similar to what we see in the ethnographic record: seasonal mobility patterns of variable distance that brought populations between known ecological zones as they seasonally came into various stages of productivity.

Over a decade of archaeological research in the Dzhungar Mountains and Koksu River Valley (Eastern Kazakhstan) illustrates the relationship between pastoralist mobility, settlement geography, and the distribution of pasture resources much more clearly. The Dzhungar Mountains, situated between the larger Tien Shan Mountain range to the south and the Altai Mountain range to the north, defines the



**Fig. 2.1** Map of Semirech'ye (Zhetisu), Kazakhstan, and the location of the site of Begash. *Inset:* the Eurasian steppe showing location of Semirech'ye

border between Kazakhstan, Xinjiang (W. China), and southwestern Siberia. The mountains themselves are a high elevation range with the highest peaks upwards of 4,000 m. Furthermore, the Dzhungar Mountains rise abruptly from a desert basin west of Lake Balkhash. Over a distance of roughly 300 km, one travels from sand dune deserts less than 500 m above sea level to high altitude glaciers well over 4,000 m. The mountains rise dramatically and provide distinct pasture ecotones, starting around 700 m above sea level and ending in alpine meadows at roughly 3,000 m in elevation.

Over a decade of archaeological survey and excavation in the Dzhungar Mountains and lowland plains has revealed a number of key facts for understanding Bronze Age mobile societies in this region. First, our data shows clearly that middle and upper elevation ranges were populated for at least the last 5,000 years, without significant abandonment by local communities (Frachetti and Mar'yashev 2007). The archaeological record includes a vast array of rock art, with imagery linking prehistoric, historic, and modern communities to specific locales within the landscape. We may interpret such social investments in specific places as indicators of established home ranges, with apparent stylistic evolution of Early Bronze Age motifs into later Iron Age motifs, which are commonly carved directly over earlier images. In kind, Iron Age imagery is superimposed by later medieval motifs, and ultimately these are overwritten by historically dated graffiti. Likewise in the burial records, we see the earliest burial structures (dating as early as the late fifth millennium BP) overbuilt by burial structures of later date—namely the Iron Age and Medieval period. These locations, much like those that host rock art, illustrate a long-term reuse of socially significant places and the cultural articulation between contemporary locales and those that were in use continuously for thousands of years before.

Beyond the reuse of ritual spaces, the region's settlement archaeology also shows the long-term reuse of specific places on the part of mobile pastoralists. Until recently, prehistoric settlements eluded detection, largely because most archaeologists failed to investigate in detail historic period campsites, many which date to no more than the last couple 100 years. Indeed, on the surface these settlements were deemed "ethnographic" and thus were overlooked in terms of their ability to speak to the prehistoric past. Yet starting from the early 2000s, our research teams started to excavate these ethnographic settlements and found that they have substantially complex, prehistoric archaeological stratigraphy. Comprehensive radiocarbon dating at select campsites shows that mobile communities have used many historical settlement locations for millennia, some for more than 4,000 years. Seasonal campsites, such as Begash, illustrate a long-term reuse pattern which has fostered a transformation in our comprehension about prehistoric mobility and migration practices. The archaeological evidence, including thin cultural levels and frequent mixing of cultural horizons, indicate that these communities maintained a mobile lifestyle. They lived in an environment well suited for hunting and mobile pastoralism.

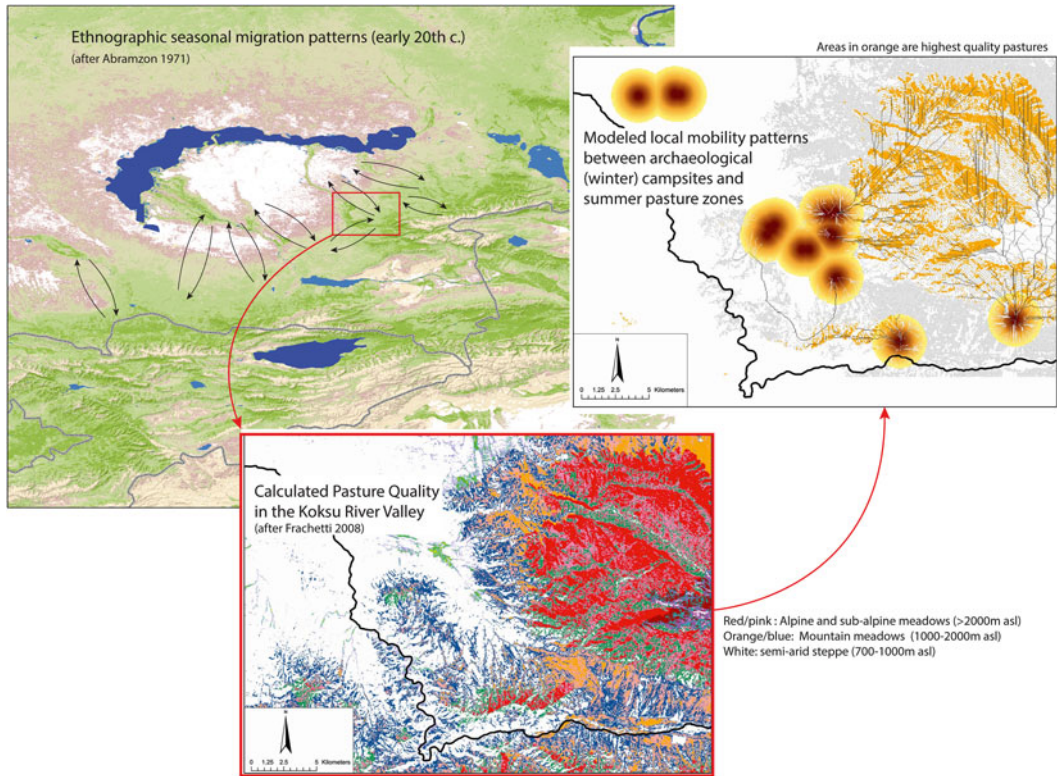
By placing the archaeological sites that we found within their environmental contexts, we can track the mobility patterns of these communities. Seasonality and altitude represent the dominant environmental pressures that shape mobility patterns in the Dzhungar Mountains and commonly influence mobility throughout most mountainous environments across Eurasia. Noted above, altitude directly correlates with a number of environmental conditions, most fundamentally rainfall, temperature, and solar radiation. These factors, in terms of the resources relevant to pastoral nomads, shape the biology and productivity of pasture grasses distributed across the piedmont and upper elevation territories of the Dzungar Mountains. Compared with the vegetation of the lowland territories (i.e., 800 m or below), highland productivity ranges from 50 to 90 % more productive, both in terms of the available pasture territory, nutrient quality of animal forage, and the density and diversity of forb and grass biomass (Fig. 2.2).

Thus, from an ecological perspective, there is a clear and obvious advantage to traveling to higher pastures during the summer where herbaceous plants cohorts are more abundant, and biodiverse. In many highland zones across Inner Asia, this simple localized pattern of mobility can support tens of thousands of herd animals. Similar, vertically transhumant mobility patterns are well documented in many mountainous environments, for example, among nomads of North and East Africa, Alpine Europe, and the Andes, to name a few.

In addition to elevation, seasonality plays a significant role in the frequency and distance of mobility. The relative quality of pastures discussed above is generally a consideration of the summer growing season, roughly late May to early September. Although highland pastures are extremely lush and rich during these months, high altitude zones fall under deep winter snow cover and grasses are deeply buried. Most herd animals have a difficult time accessing grass beneath more than 10–20 cm of snow, sometimes less for light stock (sheep/goat). Thus, during cold winter months, mobile communities seek warmer microenvironments where they can access winter forage, water, and protection from harsh winds. In some regions, winter campsites are near to agricultural communities, where fallow fields or crop stubble can be exploited (Khazanov 1994).

Given the environmental distribution of diverse resources at different altitudes and expected seasonal regimes of mobility and settlement, we have used GIS (Geographic Information Systems) to model ancient mobility patterns using the archaeological data recovered from landscape survey. This work illustrates the range of distance covered, given expected land use patterns iterated through prehistory according to the chronology and geographic distribution of ancient sites. Such analysis overwhelmingly shows that given relatively comparable environmental conditions and stable access to pasture resources, the distances traveled on a yearly basis by mobile herders has fluctuated very little throughout the last 4,000–5,000 years. There are minor deviations and sites that become more or less prevalent through time, but ultimately our data serves to demonstrate a range of mobility between 25 and 35 km, (maximum 50–70 km) between summer and winter camps annually (Fig. 2.2). With this





**Fig. 2.2** Ethnographic mobility patterns and simulated mobility patterns based on summer pasture quality (after Frachetti 2008a, b)

range as a baseline for functional/economic success, we can then explore other possible motivations for more distant travel. Of course, fluctuations in economic choices, kinship, trade, technology, political alliances or warfare all may be considered influential forces in group strategies, potentially reshaping the scope and boundaries of annual mobility rounds (Frachetti 2008a).

More than three seasons of archaeological excavation at the seasonal campsite Begash, located in the Koks River Valley of southeastern Kazakhstan, has provided a host of evidence to explore some of these factors in greater detail. Begash is small settlement complex consisting of a few house foundations, tucked into a narrow canyon and situated along a small spring-fed stream (ca. 950 m elevation). Given its location and construction characteristics, the site represents a seasonal campsite (e.g. Fig. 2.3). The scale and architectural layout of the housing at Begash indicate a resident community of no more than 10–15 individuals at a given time. However, Begash is just one site among roughly 40 documented in the valley, with typical distances between settlements not more than 2 km. Given the abundance of available small springs and opportune locations for small-scale habitation, we imagine low-density populations interspersed throughout small valleys and ravines of valleys like the Koks, where populations would spend the winter months in semi-subterranean stone homes in the lowlands and travel bi-annually to summer pastures in the highlands.

The chronology of Begash is derived from over 40 AMS/14C samples, illustrating that mobile herders have effectively occupied the same location for nearly 4,000 years, with only periodic abandonment and reconstruction (Frachetti and Mar'yashev 2007). The earliest cultural levels date to roughly 4,500 BP, with over 2 m of uninterrupted cultural stratigraphy lasting minimally until roughly 2,300 BP. After that time period, the site appears to be more stochastically occupied with subsequent settlement phases around the thirteenth century and then again in the eighteenth century.



**Fig. 2.3** Modern day seasonal campsite of highland Kyrgyz pastoralists (Photo by Author, 2011)

The zooarchaeology from Begash provides a window into economic motivations that shaped the mobility patterns of Bronze Age and later pastoralists in southeastern Kazakhstan. In fact, throughout the entire life of the site sheep and goat predominate, followed by cattle (Frachetti and Benecke 2009). While certainly a central element to Eurasian pastoralism overall, horses are surprisingly underrepresented at Begash until historical times, making up less than 5 % of the assemblage until after the thirteenth century. Wild animals comprise a relatively small but consistent percentage in the zooarchaeological record, roughly 5 % of total fauna from the earliest chronological phase into the historical era. This long-term stability in economic activity at the site exhibits the strategic employment of a mixed economy designed to exploit the broad range of environmental resources and zones that extend from more arid lowlands to highland alpine regions. Remains of desert animals, like Djeiran and goitered gazelle, provide proxy data to show how these groups traveled to arid lowlands while highland animals like red deer, elk, and antelopes demonstrate their mobility into the highlands as well. Thus, although only a small percentage of their overall economy, the wild animals show how mobile communities engaged in wide-ranging utilization of their landscape, determined by regular annual mobility orbits as well as longer excursions across a wider territory.

Given this pattern of regular seasonal mobility and periodic excursions, we were interested to document the extent and regularity of nomadic travel beyond the roughly 50 km home range that we established in the Koksu Valley. To address this question we executed an archaeological survey in the lowland desert areas located to the west of the foothill zones, where Begash and other sites in the Koksu survey were located (Frachetti et al. 2010). The results of the desert survey included archaeological sites that could be linked chronologically and typologically to mobile communities occupying the foothills and high mountains. However, this only added roughly 100 km to their migration pattern and the earliest occupations in the desert were dated after the middle part of the third millennium BP, about 3,000 years ago.

Thus, on the basis of our surveys across the range of ecologies (deserts to high mountains), we suggest that from 7,000 to 5,000 BP there was generally constrained mobility pattern, limited largely to the middle and upper-middle elevations (ca. 700–2,000 m). Periodic excursions into the arid lowlands occurred—likely for hunting—but annual mobility was not extensive among mountain pastoralists. Interestingly, around 3,500 BP, there is also evidence for the inclusion of small-scale seasonal farming among mobile pastoralists, which may have supplemented their domestic economy and potentially allowed for greater flexibility under conditions of environmental stress.

Around the start of the third millennium BP (the Iron Age) the data from the desert survey indicate a phase of more extensive mobility patterns, where mountain pastoralists seemingly expanded their home ranges and exploited a wider overall territory. Geographic evidence from the desert survey zone reveals consistent shoreline regression of small brackish lakes. Although the shoreline berms themselves are yet to be radiometrically dated, the location of diagnostic Iron Age burial mounds along the most extensive relict shorelines suggest that considerable aridization began in the region sometime at the start of the third millennium BP. At this stage we begin to see the potential to link extensions in annual mobility circuits and the larger scale migration processes. Provisionally, fluctuations in home-range mobility patterns may have led periodic extensions of seasonal territories and potential re-localization of the epicenter of mobility overall. Iterating this process over the course of many millennia, minor shifts in overall mobility and exploitation within particular regions could lead to a slow movement of population across wider territories, without evidence for rapid or orchestrated migration events.

## 2.4 Migration and Mobility in Wider View

To use this case study as an analogue for a broader examination of migration in Eurasia, we must consider the magnitude of environmental change (i.e., resource availability) or social pressure that might affect mobility patterns within particular regions. If we examine, first, the long-term paleoclimatic record, the examples discussed above reflect minor environmental shifts within the Middle to Late Holocene. For example, the scale of environmental fluctuation relevant to grassland productivity within a 100 km radius of the site of Begash was fairly nominal in comparison to the substantial environmental transitions documented north of 50° latitude between 16,000 and 10,000 years BP (cf. Frachetti 2004). During that climatic interval, paleoclimatic data indicate more drastic environmental changes, from warm to cold and back again (Graf 2010). In addition, mobility models for the Holocene must be adjusted to account for the different scales of perception that might exist within a population whose logistical mobility was oriented around hunting in vast forest/taiga/tundra ecotones. Indeed, the cross-cultural constitution of “local” versus “long-distance” mobility reflects a highly variable practical and notional reality.

Building from the recent work of Graf (2010), it pays to consider the combination of land use patterns and technologies that shaped Pleistocene hunting economies along with larger-scale ecological feedback loops that shaped the environmental milieu. As Graf argues, land use patterns relevant to arctic hunters and foragers are related to broader strategies of provisioning, the availability and provisioning of technology, and fluctuation in terms of distribution and availability of food resources within the context of extreme seasonality and restricted resource abundance.

Taking Graf’s case study of environmental change in the Altai Mountains 16,000–10,000 years ago as an example, we see a drastic shift from a glacial environment of limited productivity to a woodland environment largely covered with shrubs, an ideal environment for hunters. Such a significant shifts in environmental potential presents an ecological situation in which the Altai Mountains would have offered high yield refugia amidst otherwise severely restricted resource catchments. In a similar fashion, coastal refugia along the northeastern coast of Siberia and northwestern coast of North America



likely reflect rapidly changing environmental refugia during the time in question (15–10 kya). Thus, when considering population dispersal across Beringia, the draw of resource-rich refugia may indeed reflect a motivation for populations to strike out for new territories.

Above, I argued from an ecological perspective that diverse ecological pockets helped shape cyclical mobility patterns, which define in pastoralists' seasonal use of territories and exploitation of resources at different elevations. Numerous authors within this volume present evidence to suggest that Paleolithic hunters made the transition from northeastern Siberia to North America through only a few possible routes. In the period after crossing Beringia, the coastal route, perhaps best reflects a "string of pearls" migration model (developed upon further in several chapters in this volume, including Chaps. 6, 7, and 10). In this scenario, communities would have settled into available refugia to exploit coastal resources on a regular basis and then periodically move further along the coast to other new pockets. Depending on the size and productivity of environmental enclaves, we might expect a fairly limited resource potential, affected by seasonality and wider ocean ecology. Limited resource recovery along the coast may have sparked communities to periodically explore increasingly further south, following kelp ecosystems, for example (Brae, this volume). The "ice-free corridor" presents an alternative case where the "leap-frog" migration phenomenon may have greater explanatory strength. In this model, relatively well-established communities in the Alaskan plain would have rapidly moved south through an inland ice-free corridor, crossing the Yukon and northwestern Canada, rapidly moving towards sites in the Great Basin and northwestern USA (see Chap. 12 in this volume).

My goal in this chapter has been to illustrate through a recent archaeological example how mobility functions in territories throughout Central and Inner Asia and how these patterns of local (and wider scale) migration may serve to flesh-out our view of Paleolithic migrations that took place between Siberia and North America. We can imagine, from an ecological perspective, the reconciliation between the reality of seasonal mobility and the affordances of more sedentary lifestyles in coastal (or inland) refugia. To apply models from the Late Holocene to trans-Beringian populations living 16,000 and 10,000 years ago, one must assess the comparative productivity and availability of resources along with technological provisioning in relevant territories of habitation as well as smaller ecological pockets that could have been settled and exploited periodically to balance the risk of pioneer exploration in restricted biomes. Put another way, the realities of extensive migration should be considered from the perspective of comparative benefits of finding new productive territories and the risk of being locked into the yield of those very same environments. If a community was happily situated in a territory with ample resources and social comity, what would have inspired them to push into unknown regions? Whether the focus is Pleistocene hunters or Bronze Age pastoralists, our archaeological reconstructions must take into consideration the cyclical patterns of most mobility strategies while rectifying these movements in light of more extensive, stochastic migrations. Together, mobility and migration shaped a social and ecological process that populated the Americas in the Upper Pleistocene.

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## Chapter 3

# Early Human Expansion into Kazakhstan and Subsequent Paleolithic Migrations

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### 3.1 Introduction

The origins of humanity and its ancestral homeland, as well as the spread of human populations to various parts of the world, or simply put—migrations, have fascinated scientists and laymen alike for hundreds of years. The fact that these early human migrations are still of great interest today is evidenced by the Great Migrations conference conducted for the second time under the patronage of UNESCO.

The matter of humanity's homeland was decisively put to rest by archaeologists and paleo-geneticists decades ago, who conclusively proved that all humans belong to a single species of African descent. But for many decades prior, the center of anthropogenesis was a matter of debate. One former school of thought that prevailed in the Russian literature suggested that the *Pithecanthropus* was the link between anthropoid hominins and modern humans, and that this genus originated somewhere in the vast Asian continent, likely East Asia. During the second half of the nineteenth century, mainly in Europe, the hypothesis of the North Asian ancestral homeland for humanity was also considered. This school of thought has been slow to drop out of teaching in parts of East Asia. Central Asia came into contention for the role of ancestral homeland at the beginning of the last century, but Africa moved to the forefront. By the 1920s and 1930s, it was generally accepted that the anthropogenesis of all humans took place in Africa, as the result of numerous paleoanthropological discoveries during these decades. Most researchers (with a few exceptions) agree with the single origin theory; however, much of the spread of early hominins and eventually modern humans into Central Asia is still debated. In this chapter, I hope to briefly skim a few recent discoveries and readdress the idea of human migrations in the past.

### 3.2 Early Hominin Expansion Out of Africa

The archaeological and paleontological communities accept that African *Homo erectus sensu lato* or *H. ergaster* began to settle the vast region of Eurasia almost two million years ago in a long-term, gradual process. Over the past 15 years, skullcaps and jaws of ancient people have been found on the territory of the former Soviet Union, although so far only in Georgia, alongside pebble tools dating

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back 1.85–1.78 million years (Ferring et al. 2011). The Dmanisi Cave site in Georgia represents one of the earliest sites showing hominin movement out of South Asia and into broader Central Asia.

The first Neanderthal burial site in Central Asia was discovered by a Soviet archaeologist, A.P. Okladnikov, in Uzbekistan in 1938. Neanderthals are associated with a lithic technology often referred to as Mousterian and lived 150–40,000 years ago. By the end of the Mousterian period, Neanderthals had already populated immense regions of Africa, Asia, and Europe, and in some places even reached the Arctic Circle.

The most recent paleoanthropological discovery in the post-Soviet region was made in 2003 when an expedition led by A.P. Derevyanko, a Russian scientist working in the Obi-Rakhmat grotto of Uzbekistan, found the remains of ancient people that were at least 50,000 years old. The unique nature of the discovery was attributed to the fact that the tools found at Obi-Rakhmat dated back to the period of transition from the Middle-to-Upper Paleolithic. The results of the examination conducted on the human remains at Obi-Rakhmat were received by the Russian academic community as sensational. The skull exhibited a mixture of Neanderthal and anatomically modern human traits along with many unique parameters with no known paleoanthropological analogues. Researchers have been unable to provide an unequivocal explanation of the reasons behind such distinctive characteristics of the Central Asian hominin. So, it may serve as possible supporting evidence of hybridization of Neanderthals and modern humans, which until recently had been thought unlikely. Through stratigraphic analysis of the deposits at the site, researchers were able to trace the industrial culture dynamics over the period lasting from 90 to 30,000 years ago. The remains of a human skullcap were found in soil layers dated between 54 and 56,000 years old.

### 3.3 Recent Discoveries in Paleolithic Research in Central Asia

Beginning in 1993, a joint Kazakh-Russian expedition found many traces of Paleolithic occupation in Kazakhstan. The discovery of the unique Paleolithic complexes of Kyzyltau in southern Kazakhstan holds particular significance. The area (northeastern slope of the Karatau Mountains) is a hilly, ridged denudation plain with a complex of low-rising but pronounced cuesta-type ledges, slopes, and alluvial-fan surfaces. In this arid zone of Kazakhstan, the sites occur at the surface, and the artifacts are deposited over large areas in a continuous cover and confined to certain land forms. There are many hundreds of thousands of artifacts, forming surface scatters of several square kilometers. The joint team has not fully sorted out all the issues and several problems exist, including (1) determining the true and conventional boundaries of individual sites; (2) mapping the materials on the ground surface; (3) understanding the linear displacement of artifacts within the micro-landscape with regard to its plain, slope, and heterogeneity; (4) sorting artifacts of various ages into individual groups; etc. Obviously, the selection of research methods and applications at individual sites in areas such as Kyzyltau depends on the specific conditions and the degree of safety. The materials found here are confined to variously elevated cuesta hills (4–5 levels), ravines, and hollows.

It is important to consider not only the great antiquity of the Kyzyltau localities, but also the uniquely high concentration of findings they contain. There are dozens of sites in the region with surface cultural layer deposits, requiring further detailed mapping. Up to 300–400 items per square meter have been found at certain locations here, totaling hundreds of square meters in size, which distinguishes these Paleolithic complexes from contemporaneous sites worldwide.

Dozens of localized sites have been identified, each containing thousands and tens of thousands of artifacts. They can be broken up into four chronological groups based on the extent of corrosion. The first two groups are particularly important in addressing the issue of the first people in Kazakhstan.

However, Paleolithic periodization in Kazakhstan is complicated by the fact that the earliest complexes occur at the surface and dating them proves to be difficult. There are a number of criteria

that allow for objective comparisons between sites that compose of surface lithic scatters relative to each other, but reliable and indisputable Paleolithic periodization, and, consequently, a timeline of the earliest human settlements in Kazakhstan can only be based on comprehensive research of well-stratified Paleolithic sites.

In this regard, the stratified Lower Paleolithic sites of Koshkurgan 1–2 and Shoktas 1–3, discovered in southern Kazakhstan, are of particular interest. The artifacts occur in travertines at the foot of the southwestern slope of the Karatau Ridge. Cultural remains include a large number of stone pieces and fossilized animal bones at depths of up to 9 m from the ground surface in both subaqueous deposits and travertines of ascending karst springs.

The stone implements are homogeneous in terms of all the technical and typological characteristics: raw materials, surface integrity, typology, production, and knapping techniques. Cretaceous breccia pebbles, ranging in size from 3 to 5 cm, were widely used. The sets of stone implements at the Koshkurgan and Shoktas sites can be attributed to a microlithic industry. The represented knapping techniques are varied and include the Levallois, Citron, and radial. The identified flakes indicate the truncated chips of the production process. Bifacial techniques are virtually absent, and unifaces are frequently encountered. The shaping techniques include various types of flaking, hewing, splitting, and cleavage. There are Clactonian recesses, sometimes adjacent. Scrapers dominate the set of tools, some are blade-like, but there are also raclettes, end-scrapers, notched tools, and many tools made from pebbles.

The animal bones belong to rhinoceros, bison, and ancient camel. Electron Paramagnetic Resonance (EPR) dating of the animal bones obtained at the Koshkurgan complex gave rise to the following values:  $501 \pm 22$  thousand years ago,  $487 \pm 20$  thousand years ago, and  $470 \pm 48$  thousand years ago, which compare favorably to those obtained when dating the paleontological material.

The Koshkurgan industrial complex does not stand alone in the Central Asian region. Analogous contemporaneous complexes exist at the Kulbulak site in Uzbekistan as well as at the Paleolithic loess sites of Lahuti, Karatau, and Kuldhara in Tajikistan. Comparisons of the materials discovered at Koshkurgan with the European micro-industrial complexes of the Acheulean, such as those at Vertesszöllos (Hungary), Bilzingsleben (Germany), and Isernia La Pineta (Italy), point to their great similarity. In the East, there are similar complexes in China (Donggutuo) and Japan (Babadan, Zazaragi, Takamori). Thus, Koshkurgan links the West and East of Eurasia during the Mindelian stage. The questions raised in connection with Koshkurgan are important and require further in-depth research of the unique Early Paleolithic monuments in the Karatau region.

In recent years, the Early Paleolithic complexes discovered on the Ustyurt Plateau in Western Kazakhstan contain artifact deposits at the surface, and are indicative of ancient settlements on the east coast of the Caspian Sea during the Pleistocene. Such complexes have been found in the Emba River region on the western slopes of the Mughalzhur Hills, as well as on the northern coast of the Aral Sea and Lake Balkhash. All this testifies to the potential of finding stratified Paleolithic sites in the future, even from these early stages.

Acheulean sites have been discovered in Central Kazakhstan as well. Here, tools were made from black and grayish-green colored flint rocks. One such site, Kudaikol, is located on the northeastern periphery of Sary-Arka. Among the implements identified at the site were bifaces (tools flaked on both sides of the stone), scrapers used for processing of animal skins as well as wood, and core nuclei from which flakes and blades were detached and then used as tools.

The typical implement in the Acheulean toolkit was the hand-axe or biface—sharp-edged tools flaked on both faces. Hand-axes were widespread in Africa. At the ancient rock ledges of the Mughalzhur Hills, where prehistoric people came to make tools for several thousand years, dozens of lithics were discovered per square meter.

Southern regions of Siberia and the Far East could have been settled for the first time by people from Kazakhstan, Central, and East Asia during the Pleistocene, as has been indicated by artifacts from the Altai, Baikal, and Amur Region.

In the Altai region of southern Siberia, Siberian archaeologists made an amazing discovery—the Karama site in the valley of the Anuy River.<sup>1</sup> The unique nature of the finds in the Altai Mountains is due to the multi-meter thick stratified deposits, which yielded a fairly complete picture of the development of this industrial complex over a vast period of time. According to preliminary results of the examination of the stone industries, as well as palynological analysis, the Karama site today is the oldest one in Russia.

Therefore, Paleolithic people lived in North Asia within the southern mountain belt of Siberia; eventually they made attempts to settle north of the mountain belt. Traces of such attempts exist in different parts of North Asia, and investigations of these traces usually raise numerous questions regarding their age and origin. The most indisputable of these traces were found in the valley of the Vilyuy River, a tributary of the Lena River, by an archaeologist Y.A. Mochanovymi and on the Chukchi Peninsula by N.N. Dikov. These discoveries have been a source of heated debate, especially on the subject of their age, but in most cases the findings at these sites are undoubtedly artifacts. There is good reason to believe that the sites are from the Middle Pleistocene—the time of deglaciation of the maximum ice (Samarovsk in Siberia) or the first half of the transitional period from maximum glaciation to the subsequent interglacial period. Even though this passage of Paleolithic people from the southern Siberian mountain belt reached Beringia, the northeastern end of North Asia, it did not lead to the settlement of vast territories north of the southern mountain belt, probably due to the scarce population of the belt itself.

### 3.4 Peopling the Americas from Northern Central Asia

Paleolithic cultures of Kamchatka and Chukotka are very significant when we address the issue of the initial colonization of northeast Asia and the Americas. Several hypotheses on the subject of the first human migration to the Americas have been presented over the years, including the transpacific (from Australia to South America) route, migrations by boat along the coast of North America, and the Solutrean connection. The latter theory, which was proposed by D. Stanford and B. Bradley (Stanford and Bradley 2002, 2012), stated that the first humans migrated from northern Cantabria in northern Spain to the northeast coast of America during glaciation. However, the dominant theory, accepted by most researchers today, notes that people came to North America from Asia over a land bridge between the continents and that such relocation occurred more than once (discussed in more detail in several chapters later in this volume). The hypothesis of a connection between the two continents is based on the rising and lowering of ocean levels in relation to periods of glaciation.

During the Last Glacial Maximum, a large area of the continental shelf became exposed between Chukotka and Alaska. This was not a narrow isthmus, but an enormous region called Beringia, the width of which reached 2,000 km from north to south. Thick ice sheets formed in northern Europe and North America. Much of northern Siberia and Beringia was covered by tundra. Each time the two continents were joined, animals migrated from the Old World to the New and back again. Mammoths, musk oxen, bison, horses, reindeer, bears, and many other animals went from Siberia to the Americas, and people followed the animal herds from Asia to North America. The exact age when humans first migrated into the New World is still heavily debated. The debate over the age of this migration is dealt with in this volume. No one doubts that the Americas were well settled before 10,000–12,000 years ago; archaeological finds dating back to that period are referred to as the Clovis culture, named after a site in the state of New Mexico where 11,500 year old stone tools and spear heads were discovered for the first time in the 1930s. But the issue of whether that was the first settlement has not been resolved.

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<sup>1</sup> An analogous stone industry was discovered in the Denisova Cave as well.

In North and South America, archaeologists have discovered several sites of ancient hunters older than Clovis. One of the most noteworthy of these pre-Clovis sites is in the southern tip of Chile. In 1977, American archaeologist T. Dillehay began excavations near the town of Monte Verde in southern Chile (Dillehay 1989, 1997). He found stone tools, traces of fires, and gnawed mastodon bones. But even though this was undoubtedly a site of ancient hunters, disputes about the age of the discovery arose again. Dillehay claimed that people lived here 1,000 years before the Clovis era, in other words over 12,000 years ago. Subsequent digs have led to finding traces of human habitation and more reliable dating, verifying that the site is roughly 13,000 years old. An important discovery in the debate over the original settlement of the Americas was made with the discovery of the Meadowcroft site in the state of Pennsylvania. Here, a group of scientists led by James Adovasio found stone tools and other traces of human habitation; although controversial, the dates are clearly pre-Clovis (Adovasio et al. 1998, 1999).

### 3.5 Conclusion

Most researchers accept that the first people came to the Americas earlier than 12,000 years ago. Thus, as a result of many large waves of migration, humans settled enormous territories in various geographical and climatic zones from humanity's ancient African homeland and over the course of tens of thousands of years formed outwardly different, but morphologically and genetically similar races, united as a single species.

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# Chapter 4

## Tracing Human Movements from Siberia to the Americas: Insights from Genetic Studies

Theodore G. Schurr

### 4.1 Introduction

In keeping with the theme of the conference volume, “Great Migrations: Asia to America,” I will present some recent results from our studies of genetic diversity in northeast Asian and Native American populations. As will be shown in this chapter, the Altai-Sayan region is crucial to our understanding of the human colonization of the Americas because it appears to be the area from which human populations began expanding eastward from, into the New World some 25,000 years ago, and then to the west during the past couple of 1,000 years with the expansion of Turkic- and Mongolic-speaking groups. To begin this discussion, I will first briefly outline some of the questions concerning Native American and Siberian prehistory that we have been trying to address through our genetic studies. Next, I will provide a brief overview of mitochondrial DNA and Y-chromosome variation and explain how data generated from these parts of our genome are used for population history studies. I will subsequently elaborate upon the results of our genetic studies in the Altai-Sayan region and the Americas, in particular, noting the biological connections that emerge from this work. Finally, I will summarize these genetic data and discuss their implications for the population history of Eurasia and the Americas.

### 4.2 Research Questions

One of the main questions concerning the prehistory of the Americas is the place of origin of the ancestors of modern Native American populations. For over two decades, it has been thought that the region encompassing Mongolia and the Altai-Sayan Mountains was the area from which these ancestors may have arisen (Fig. 4.1). The four major mitochondrial DNA haplogroups or maternal lineages present among Native Americans are found in populations from this region (Kolman et al. 1996; Merriwether et al. 1996; Sukernik et al. 1996; Torroni et al. 1993a), as are founding Y-chromosome haplogroups or paternal lineages (Bortolini et al. 2002, 2003; Karafet et al. 1997, 2001; Lell et al. 1997, 2002; Santos et al. 1999; Zegura et al. 2004). These observations do not necessarily indicate that the migration or demic expansion that led to the colonization of the Americas began in the Altai-Sayan region, only that the genetic lineages present in this area are most closely similar to those in the Americas.

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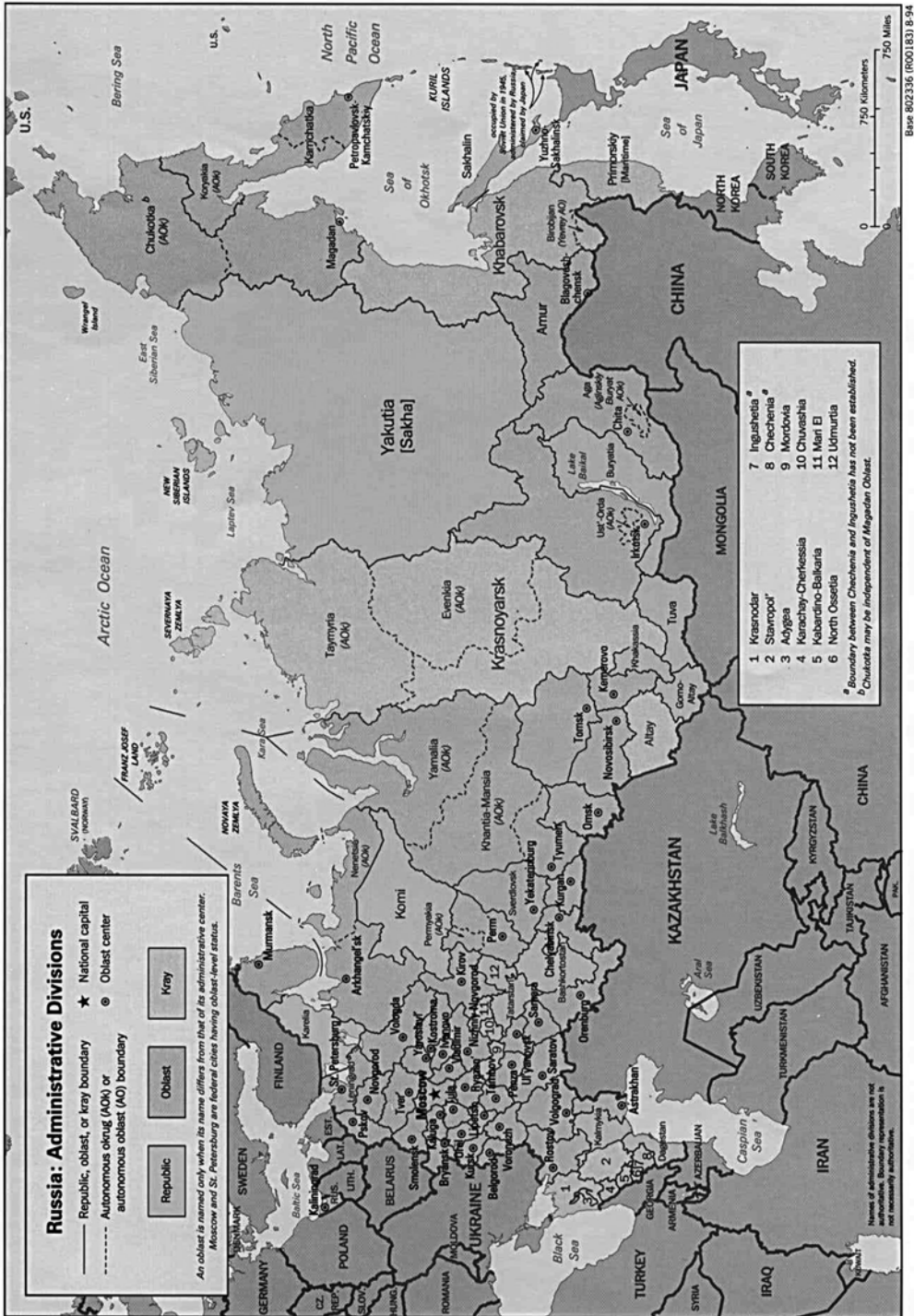


Fig. 4.1 A map of Russia, showing the Altai-Sayan region in southern Siberia ([http://www.lib.utexas.edu/maps/commonwealth/russia\\_pol\\_1994.pdf](http://www.lib.utexas.edu/maps/commonwealth/russia_pol_1994.pdf))

The Altai-Sayan region was first settled some 30,000–40,000 years ago, based on archeological data (Goebel 1999; Goebel et al. 2008). Ethnographic and linguistic evidence also indicates that it may have been the source area for some native Siberian populations (e.g., Potapov 1962, 1964). This region is further thought to be the region in which the Turkic language family arose and from which it spread to other parts of Eurasia (Golden 1992; Menges 1968). For all of these reasons, genetic data are useful for elucidating the population dynamics of the region at different periods of time that led to the current geographic patterning of biological diversity.

For the past 8 years, my laboratory group has been investigating the ethnohistory and genetic diversity of Turkic-speaking populations. This work has involved populations from Turkey (Gokcumen et al. 2011), the Caucasus (Sen et al. 2014), Central Asia (Dulik et al. 2011; Gokcumen et al. 2008; Schurr and Pipes 2011), and the Altai-Sayan region (Dulik et al. 2012b). In this chapter, I will review our work with indigenous groups from the Altai-Sayan region (Fig. 4.2). In addition, while details about the emergence of the Altaic language family can be found elsewhere (e.g., Robbeets 2010, 2014), I will also discuss the implications of our genetic data for the Altaic language family history.

Regarding the Americas, there has been great interest over the past 25 years in determining the timing and number of migrations that entered the Americas. In particular, researchers have wanted to know whether all Native American groups—those placed in the Amerind, Eskimo-Aleut, and Na-Dene language stocks by Greenberg et al. (1986)—arose from a single or multiple independent wave(s) of migration (Kemp and Schurr 2010; O’Rourke 2011). Recent work by a number of research teams (Fagundes et al. 2008; Kitchen et al. 2008; Mulligan et al. 2008; Tamm et al. 2007) have proposed a somewhat different scenario—called by some the Beringian Incubator Model—to account for the biological and linguistic diversity of Native American populations (Fig. 4.3). In this model, ancient Asian populations expanded eastward from a presumed Altaian or south-central Siberian homeland into Beringia around 25,000 years before present (BP). In Beringia, which existed as a massive land bridge during the Last Glacial Maximum (LGM), members of this ancestral population lived in the region for many thousands of years and began to genetically differentiate from their Asian antecedents, becoming “Beringian” in the process. This transformation is evidenced by the evolution of a number of distinctive mtDNA (female) (A2, B2, C1b, C1c, C1d, C4c, D1, D4h3, X2a) and Y-chromosome (male) (C3b, Q-M3) haplogroups in ancestral Native American populations (Achilli et al. 2008; Fagundes et al. 2008; Forster et al. 1996; Perego et al. 2009, 2010; Tamm et al. 2007; Torroni et al. 1993a, b).

After this incubation period, ancestral Native American populations expanded southward along the northwest coast of North America around 16–18,000 BP, reaching the southern tip of South America by 15,000 BP (Dillehay 2000). Somewhat later, populations expanded from Beringia into northern North America and settled the deglaciated regions of the continent, establishing themselves there before the eventual submergence of the Bering land mass. In the descendants of these populations, additional mtDNA (A2a, A2b, D2, D3) and Y-chromosome (Q1a5, Q1a6) haplogroups evolved from the original Beringian set (Dulik et al. 2012a; Helgason et al. 2006; Saillard et al. 2000; Schurr et al. 1999; Starikovskaya et al. 1998; Rubicz et al. 2003; Zlojutro et al. 2006), reflecting their divergence from earlier founding lineages. During this period, there also appear to have been some back migration of ancestral Native American groups, including Na-Dene speakers moving into interior Siberia and giving rise to the Kettic-speaking populations there (Kemp and Schurr 2010; Tamm et al. 2007; Vajda 2010).

In addition to questions concerning the initial peopling of the Americas, we have been investigating the genetic histories of circumarctic populations, particularly those of Eskimo-Aleut and Athapaskan Indian populations. We have focused much of our attention on the genetic histories of the Inuvialuit, Gwich’in, and Tlicho (Dogrib) populations from the Northwest Territories, Canada, where there is considerable linguistic and cultural diversity among Dene First Nations (Fig. 4.4). Some of the questions that we are exploring include the timing of the settlement of northern North America, the genetic

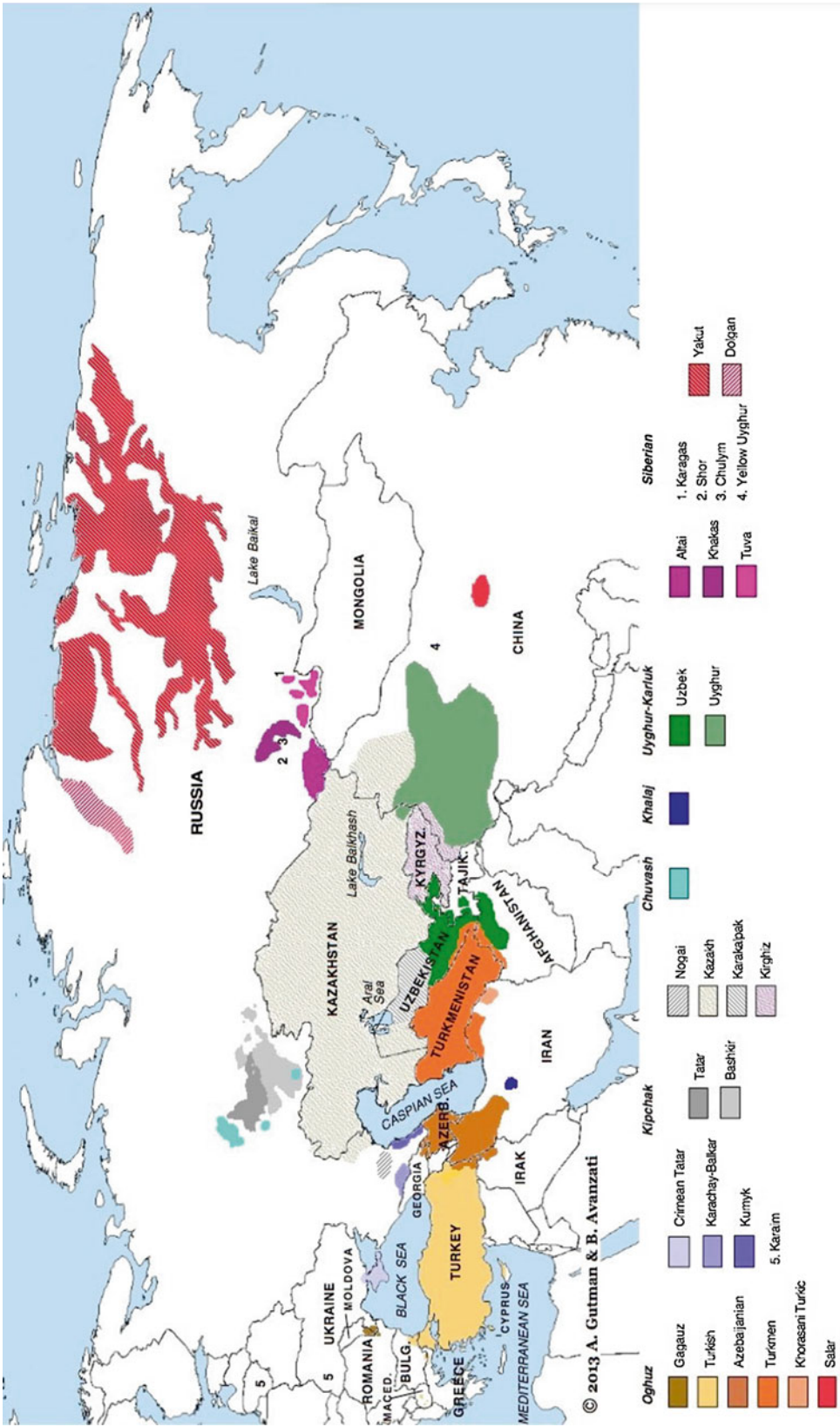
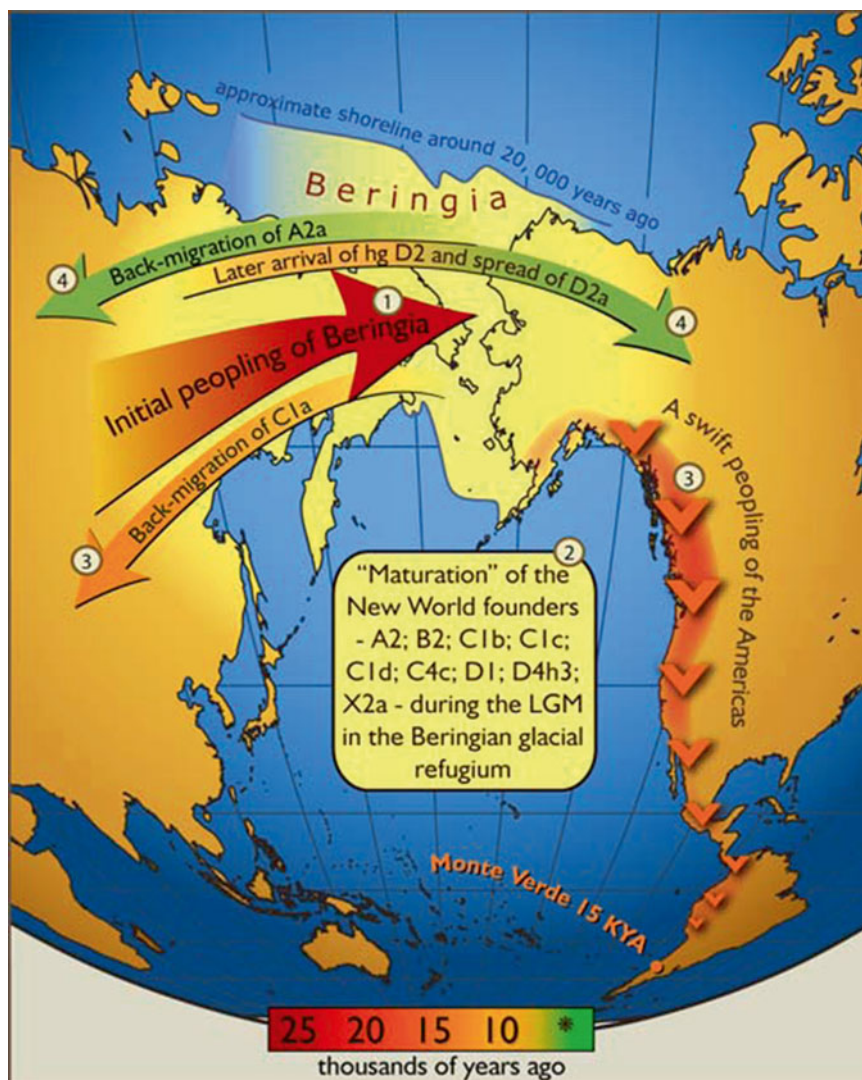


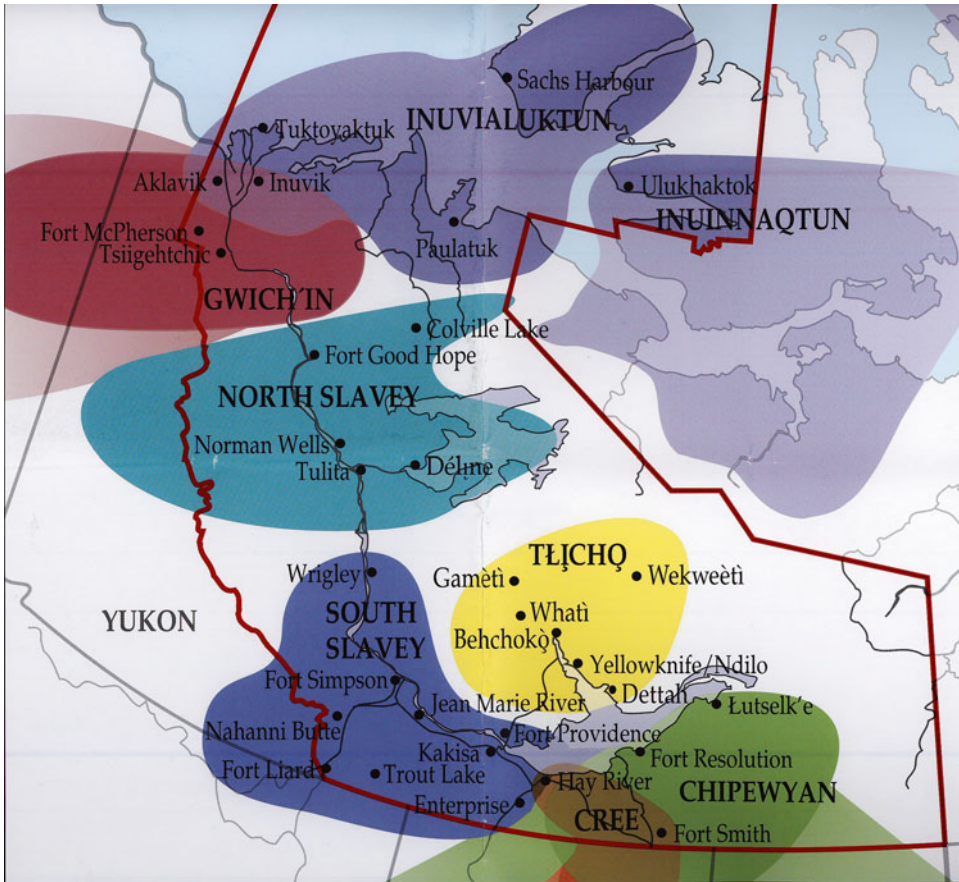
Fig. 4.2 A map of Turkic language speaking populations (from <http://www.languagesgulpter.com/eng/Turkic.html>)





**Fig. 4.3** A schematic illustration of maternal gene flow in and out of Beringia. The colors of the arrows correspond to approximate timing of the events and are decoded in the colored time-bar. The initial peopling of Beringia (depicted in light yellow) was followed by a standstill after which the ancestors of the Native Americans spread swiftly all over the New World while some of the Beringian maternal lineages, such as C1a, spread westwards. More recent (shown in green) genetic exchange is manifested by back-migration of A2a into Siberia and the spread of D2a into northeastern America that post-dated the initial peopling of the New World (Reprinted from Tamm, E., et al. (2007). Beringian standstill and spread of Native American founders. *PLoS ONE*, 2(9), e829 doi:[10.1371/journal.pone.0000829](https://doi.org/10.1371/journal.pone.0000829))

relationships between circumarctic groups and Amerindian populations to the south, and the dates at which Eskimo-Aleut and Na-Dene populations emerged. With regard to Eskimo-Aleut-speaking populations, we are investigating the peopling of the Arctic through our work with the Inuvialuit, who live in the Mackenzie Delta region and adjacent islands in the Arctic Sea. Data from this area is filling a crucial gap in the sampling of Inuit groups across the Arctic Coast, and will help to clarify the timing and process of expansion of one or more Eskimoan groups across the region (Bosch et al. 2003; Dulik et al. 2012a; Gilbert et al. 2008; Helgason et al. 2006; Rasmussen et al. 2010; Saillard et al. 2000; Starikovskaya et al. 1998; Vilar et al. 2014).

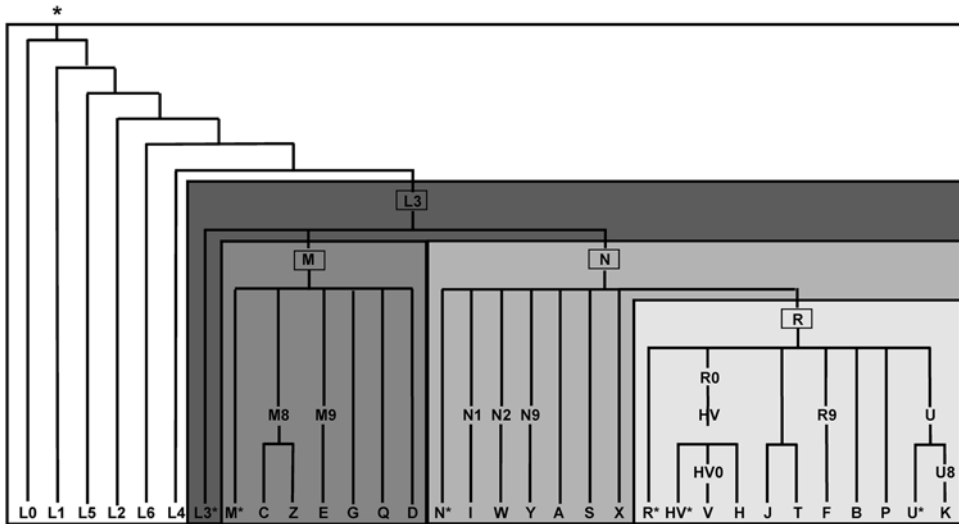


**Fig. 4.4** A map showing the territorial distributions of Aboriginal populations in the Northwest Territories ([http://www.ece.gc.ca/files/publications/024-Official\\_Languages\\_Map-web.pdf](http://www.ece.gc.ca/files/publications/024-Official_Languages_Map-web.pdf))

### 4.3 Genetic Background

Before delving further into the details of these studies, I will provide some basic background information on genetic variation in human populations. In many studies of human population history or phylogeography, variation in the mitochondrial DNA and Y-chromosome is analyzed. The mitochondrial DNA (mtDNA) is maternally inherited, being passed down from mother to daughter each generation. Similarly, the non-recombining region of the Y-chromosome (NRY) is directly passed down from father to son each generation. Thus, by analyzing mtDNAs, we are able to reconstruct the maternal genetic history of different human populations, and likewise with the NRY the paternal genetic history of these groups (e.g., Underhill and Kivisild 2007). By contrast, autosomal markers, those present on chromosomes 1–22 and the X-chromosome, are passed down from both parents to their children after undergoing some reshuffling through recombination during the formation of germ cells. Although not revealing specific lineages like the haploid mtDNA and NRY, these markers reflect genetic contributions from all ancestors on both the mother's and father's sides of the family, hence, revealing the proportional ancestry from different geographic regions of the world (e.g., Li et al. 2008).

In the mtDNA we search for mutations or markers that define different branches of the human mtDNA phylogeny or tree. Specific markers or single nucleotide polymorphisms (SNPs) define different branches of this tree, being markers of genealogically related haplotypes (Fig. 4.5), and can be



**Fig. 4.5** A simplified human mitochondrial DNA tree (Reprinted from van Oven, M., & Kayser, M. (2009). Updated comprehensive phylogenetic tree of global human mitochondrial DNA variation. *Human Mutation*, 30(2), E386–394; used with permission of John Wiley & Sons, Inc.)

classified using the alphanumerical nomenclature shown here (for a more detailed phylogeny, see van Oven and Kayser (2009)). The deepest and most diverse branches of the mtDNA tree are found in Africa, due to it being the place of origin of modern humans, while haplogroups found outside of Africa derive from macrohaplogroups M, N, and R, which ultimately evolved from African L3 (Behar et al. 2008; Ingman et al. 2000; Quintana-Murci et al. 1999; Macaulay et al. 1999; Salas et al. 2004).

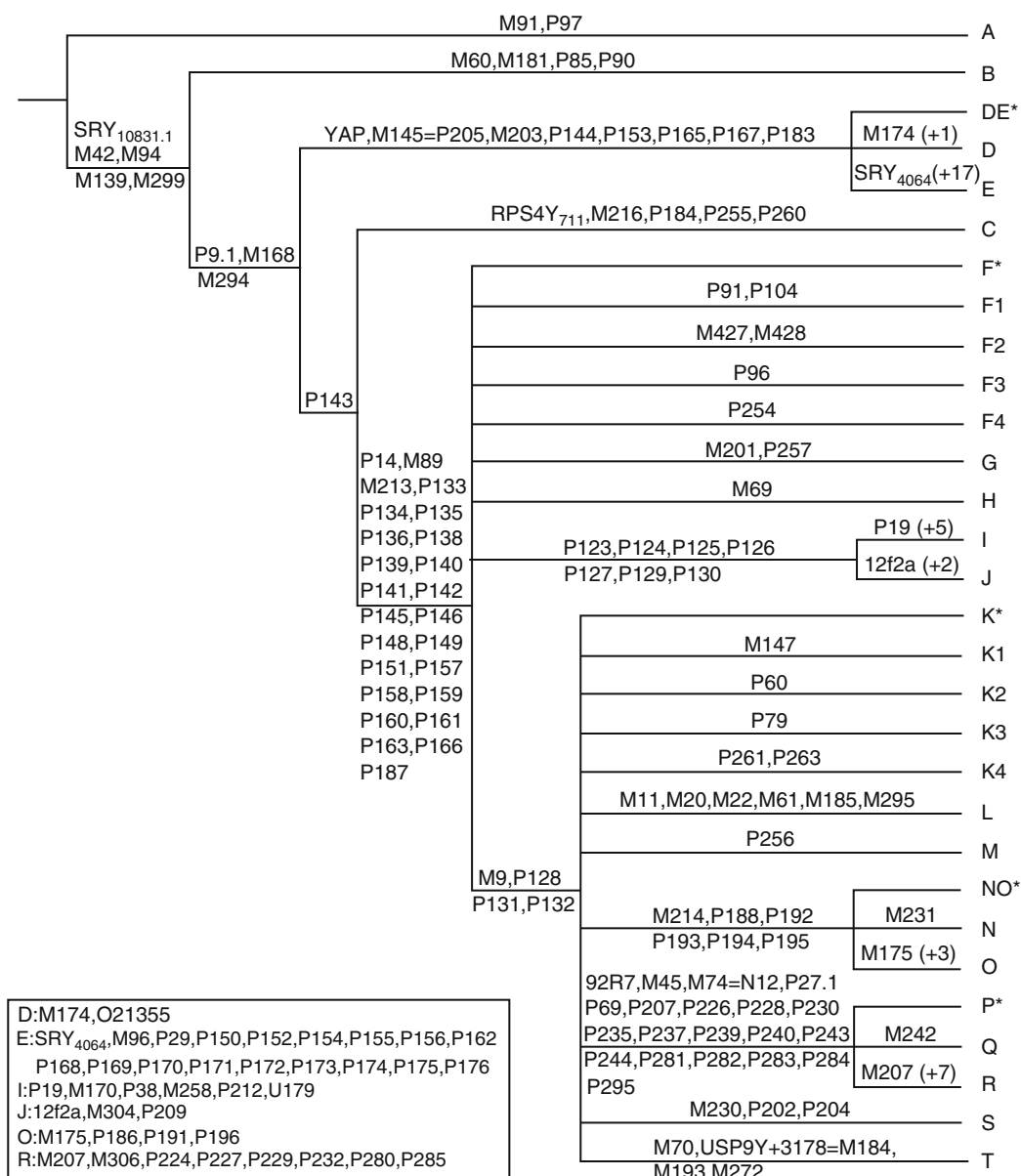
Through many years of work, researchers have generated sufficient data on a global scale to allow for the production of maps showing the distribution and frequency of these mtDNA haplogroups or maternal lineages in world populations (Fig. 4.6). Note the pattern of variation in the Americas, where haplogroups A, B, C, and D are very common. These lineages have their roots in northeast Asia and were part of the maternal genetic makeup of the ancestral populations of Native Americans (Derenko et al. 2003, 2007, 2010; Kivisild et al. 2002; Schurr 2004; Torroni et al. 1993b; Volodko et al. 2008). Also note that haplogroups A and D predominate in the circumarctic region, a fact to which I will return later in this chapter.

Similar to the mtDNA tree, we search for mutations or markers that define different branches of the human Y-chromosome phylogeny or tree (Fig. 4.7). Different markers define different branches of this tree, as shown here, and can be classified using the alphanumerical nomenclature (for a more detailed phylogeny, see Y-chromosome Consortium (2002) and Karafet et al. (2008)). The deepest branches of the tree are found in Africa (A, B) while most haplogroups or lineages are found outside of Africa (C–R), excepting E, a lineage that expanded in both Europe and Africa (e.g., Cruciani et al. 2004, 2007) represents expansions, with C, D, and F being some of the older branches that evolved from B before being dispersed outside of Africa.

As before, researchers have now generated sufficient data on a global scale to allow for the production of maps showing the distribution and frequency of these Y-chromosome haplogroups or paternal lineages in world populations (Fig. 4.8). Please note the pattern of variation in the Americas, where haplogroup Q is very common and C is present mostly in North America. These lineages also have their roots in northeast Asia and were part of the paternal genetic makeup of the ancestral populations of Native Americans (e.g., Derenko et al. 2006; Karafet et al. 1997, 2002; Lell et al. 1997, 2002; Zhong et al. 2010). I will discuss the finer genetic subdivisions of haplogroup Q in the following pages.





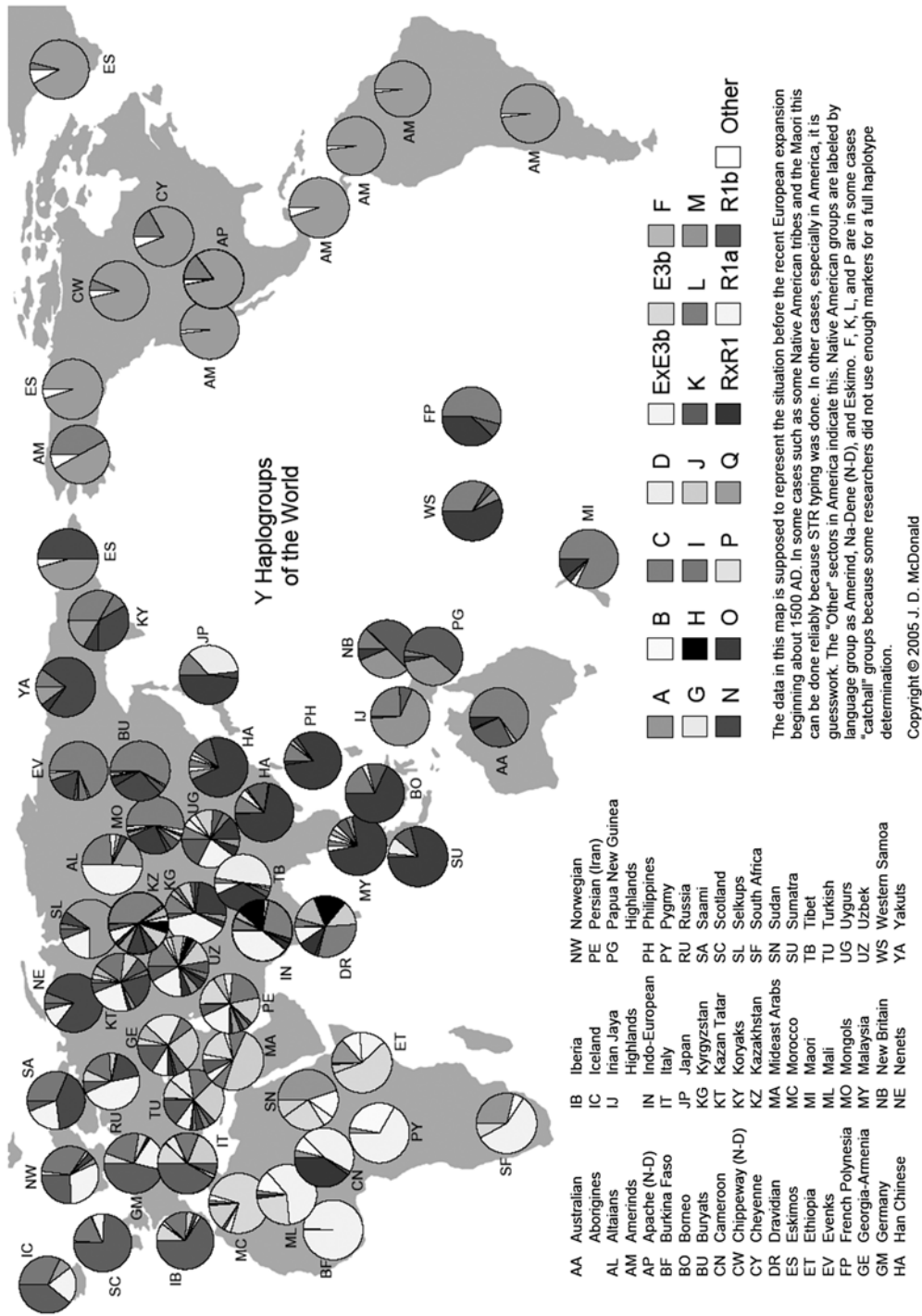


**Fig. 4.7** A simplified Y chromosome parsimony tree. Mutation names are indicated on the branches. The subtrees corresponding to major clades A–T are collapsed in this figure. Haplogroup names are indicated at the tips of the tree. Mutation names are given along the branches; the length of each branch is not proportional to the number of mutations or the age of the mutation. The order of phylogenetically equivalent markers shown on each branch is arbitrary (Reprinted from Karafet, T., et al. (2008). New binary polymorphisms reshape and increase resolution of the human Y chromosomal haplogroup tree. *Genome Research*, 18, 830–838; used with permission of Cold Spring Harbor Laboratory Press)

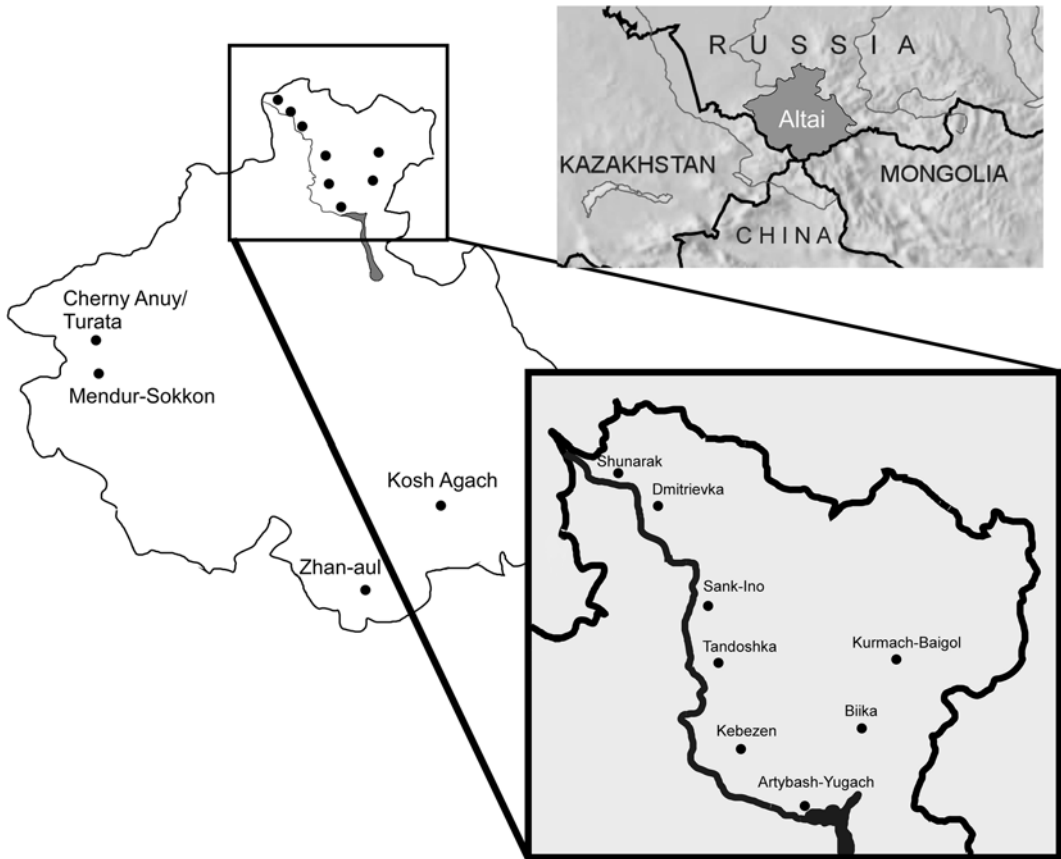
#### 4.4 Altaian Prehistory

Over the past two decades, we have worked in different parts of the Altai Republic, Russia, which sits at the juncture of Russia, Kazakhstan, China, and Mongolia (Fig. 4.9). Our investigations have involved Altai-kizhi (southern Altaians), various northern Altaian groups (Chelkan, Tubular,





**Fig. 4.8** A map showing the distribution of Y-chromosome haplogroups around the world (<http://www.sc.illinois.edu/~mcdonald/WorldHaplogroupsMaps.pdf>)

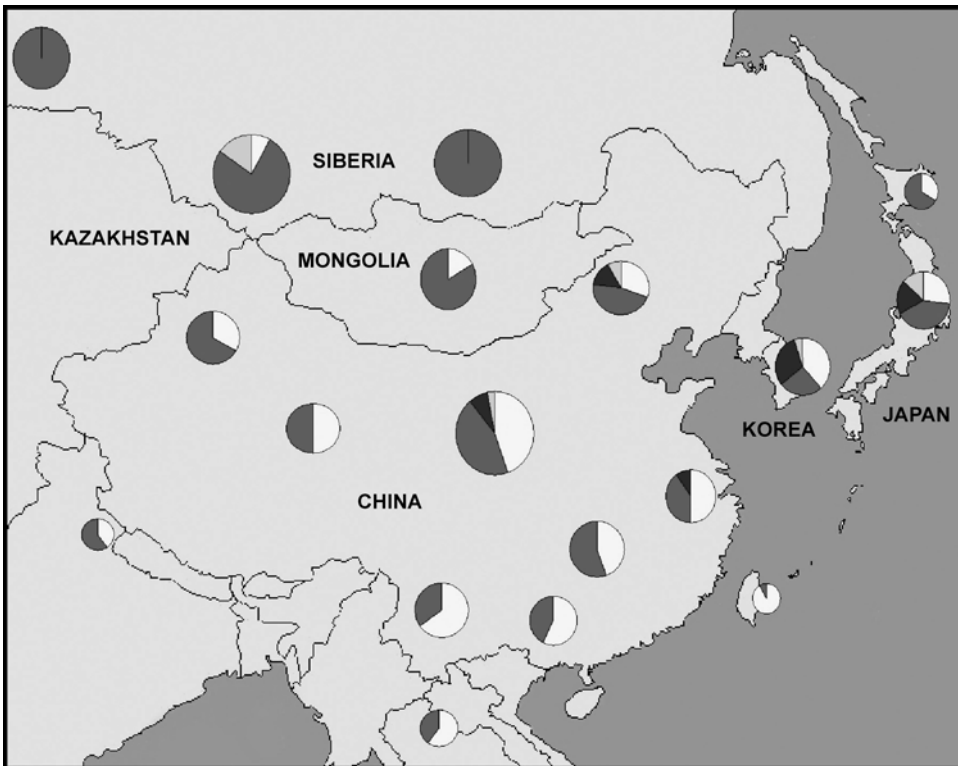
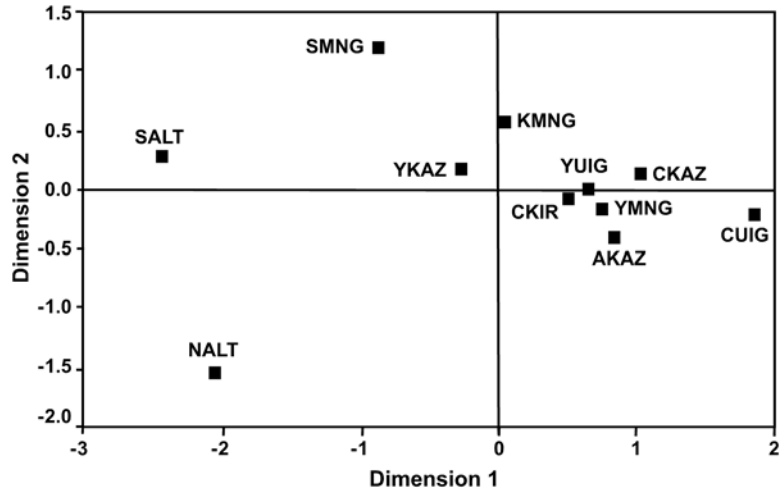


**Fig. 4.9** A map of the Altai Republic and locations of sample collections (Reprinted from Dulik, M.C., et al., 2012. Mitochondrial DNA and Y chromosome variation provides evidence for a recent common ancestry between Native Americans and indigenous Altaians. *American Journal of Human Genetics*, 90, 229–246; used with permission from Elsevier)

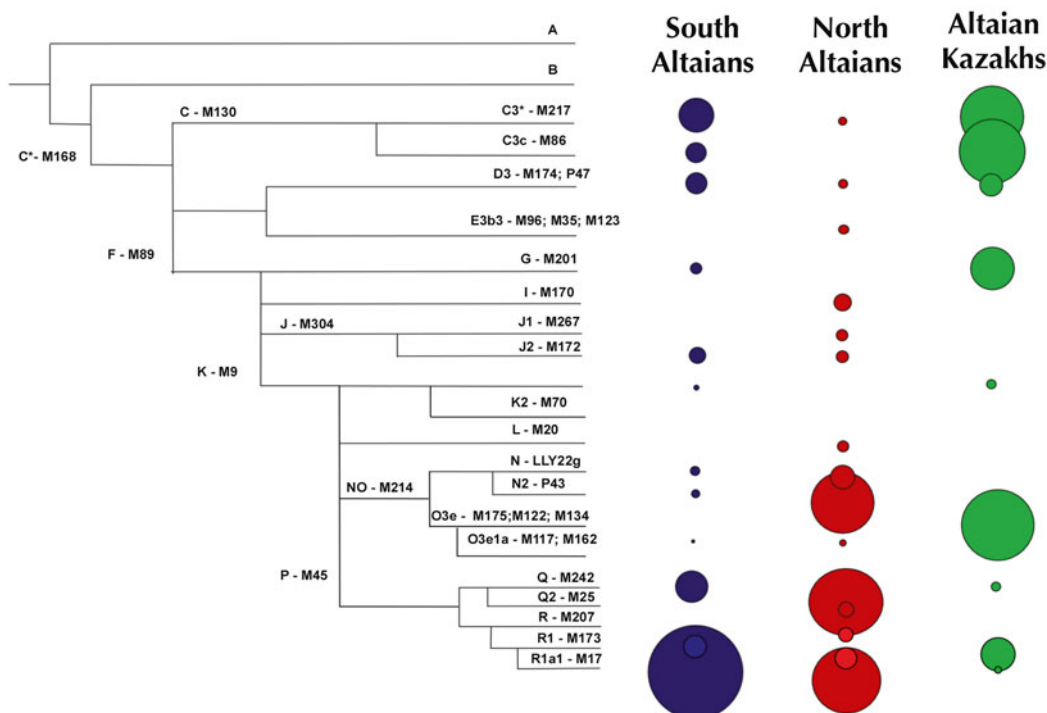
Kumandin), and Altaian Kazakhs, who arrived there in the nineteenth century after leaving Mongolia (Dulik et al. 2011, 2012b; Gokcumen et al. 2008). We characterized mtDNA and Y-chromosome variation in these populations and analyzed the resulting data with phylogenetic and statistical methods (e.g., Dulik et al. 2012a, b). Our goal was to clarify the population histories of these groups and also clarify the role that the Altai-Sayan region played in the settlement of Siberia and the Americas.

When estimating genetic distances between populations based on their mtDNA haplogroup or lineage composition, we observed several trends. First, all indigenous Altaian populations cluster to the left side of the multidimensional scaling (MDS) plot (which illustrates genetic relationships among human groups in two-dimensional space) relative to Kazakh and Mongolian populations, which cluster together on the right side (Fig. 4.10). The southern Altaians are also distinctive from the northern Altaians, who speak different Turkic languages from those of southern Altaian populations. Interestingly, southern Altaians have mtDNAs from a maternal lineage (C1a) that is a sister haplogroup for several founding lineages for Native American groups (C1b, C1c, C1d) low frequencies, whereas northern Altaians lack this lineage all together (Dulik et al. 2012b; Schurr and Wallace 2003; Tamm et al. 2007). Altaian populations also have a number of different branches of mtDNA haplogroup D (D5\*, D5a, D5b, and D5c) that are seen throughout northeast Asia (e.g., Derenko et al. 2007; Kivisild et al. 2002; Tanaka et al. 2004) (Fig. 4.11). Those belonging to D5c appear in Siberia, northern China, Japan, and Korea, suggesting possible maternal genetic connections among Altaic-speaking populations in East Eurasia.

**Fig. 4.10** A multidimensional scaling plot (MDS) of  $F_{ST}$  estimates for Central Asian populations and Altaian Kazakhs, based on mtDNA data (Reprinted from Gökçumen, O., et al. (2008). Genetic variation in the enigmatic Altaian Kazakhs of south-central Russia: Insights into Turkic population history. *American Journal of Physical Anthropology* 136, 278–293; used with permission of John Wiley & Sons, Inc.)

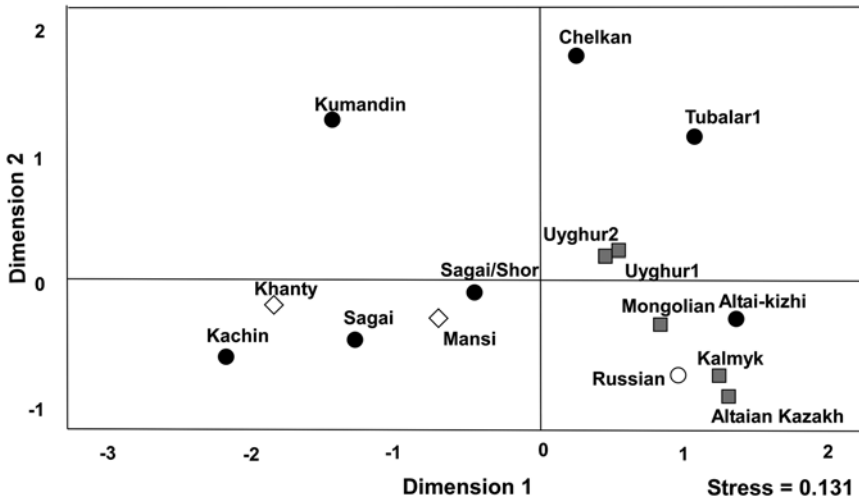


**Fig. 4.11** A map showing the distribution of mtDNA haplogroup D5 in North-East Asia. White = D5\*; Medium grey = D5a; dark grey = D5b; and light grey = D5c (Reprinted from Schurr, T.G., Osipova, L.P., Zhadanov, S.I., & Dulik, M.C. (2010). Genetic diversity in native Siberian populations: Implications for the prehistoric settlement of the Cis-Baikal. In: A.W. Weber, M.A. Katzenberg & T.G. Schurr (Eds.), *Prehistoric Hunter-Gatherers of the Baikal Region, Siberia: Bioarchaeological Studies of Past Lifeways* (pp. 121–134); used with permission of the University of Pennsylvania Museum of Archeology and Anthropology Press)



**Fig. 4.12** Frequencies of NRY haplogroups in Indigenous Altaians and Altaian Kazakhs (based on data presented in Dulik, M.C., et al. (2011). *PLOS ONE*, 6(3): e17548. doi:[10.1371/journal.pone.0017548](https://doi.org/10.1371/journal.pone.0017548))

From a Y-chromosome perspective, northern and southern Altaian populations are also distinct from each other, as well as each from Altaian Kazakhs (Dulik et al. 2011, 2012b) (Fig. 4.12). Haplogroups C3\* and C3c are quite common in southern Altaians and Altaian Kazakhs but occur at very low frequencies in northern Altaians. Haplogroup C, to which C3\* and C3c belong, is an ancient male lineage in East Eurasia widely dispersed across the region (e.g., Zhong et al. 2010). A very old paternal lineage, haplogroup D3 appears in all of these populations, while also occurring in Tibetan, Koreans, and Japanese populations (Kim et al. 2000; Qi et al. 2013; Shi et al. 2008). West Eurasian lineages (G, I, J, K) (Al-Zahery et al. 2003; Cinnioglu et al. 2004; Quintana-Murci et al. 2001; Underhill et al. 2001) generally appear at low frequencies in the Altaian populations, and may have been contributed by nomadic horse cultures that expanded eastward several thousand years ago (Anthony 2007; David-Kimball et al. 1995; Grousset 1970). By contrast, haplogroup N appears only in indigenous Altaians and other largely northern ethnic groups, implying connections between them and northwest Siberians in which this lineage occurs at a high frequency (Derenko et al. 2006, 2010; Volodko et al. 2008; Zhong et al. 2011). Haplogroup O3e occurs at high frequency in the Kazakhs, implying an East Asian/Han Chinese influence, given the ubiquity of this lineage in these populations (e.g., Shi et al. 2005). Haplogroup Q is also an old, complex lineage in East Eurasia (e.g., Karafet et al. 2002; Sengupta et al. 2006) and appears primarily in indigenous Altaians, especially northern populations. Haplogroup R1 is very common in indigenous Altaians, with R1a being the most common lineage in southern Altaians. R1a arose after the LGM (ca. 6,000 BP) and was dispersed quite broadly across Eurasia in two distinct directions (Europe and southern Central Asia), with the R1a haplotypes reaching south Siberia likely being introduced by nomadic cultures from the Pontic steppe region (Underhill et al. 2010, 2014).



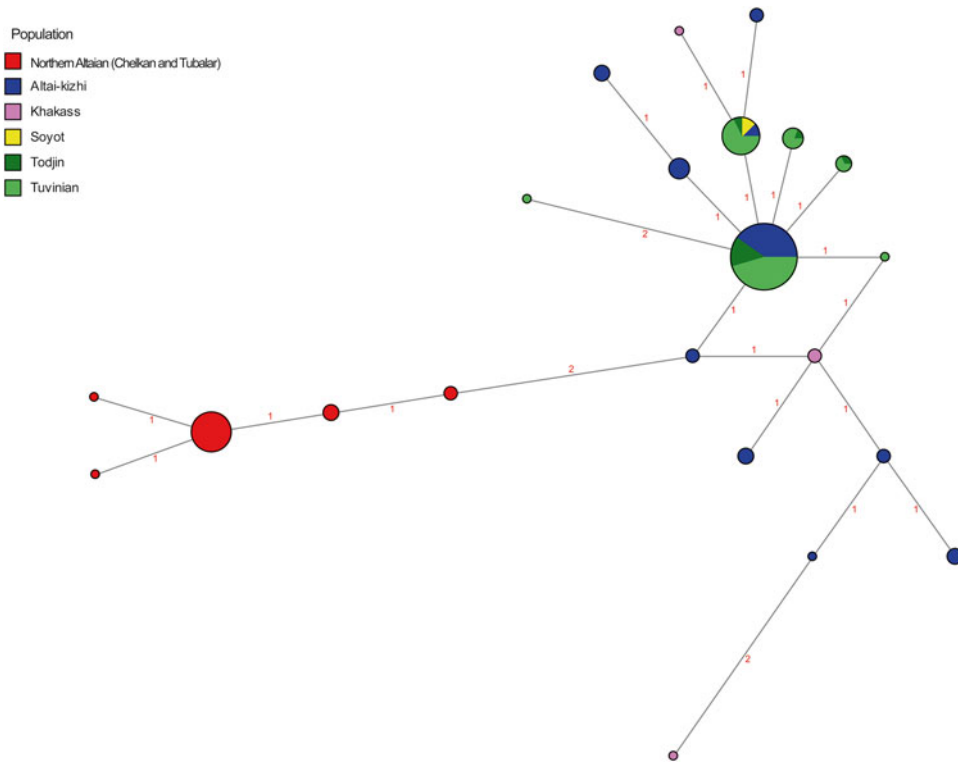
**Fig. 4.13** A multidimensional scaling plot (MDS) of the RST genetic distance estimates for Central Asian populations and Altaian Kazakhs, based on Y-chromosome STR data. Circle, southern Siberian; diamond, northwestern Siberian; square, Central Asian (Reprinted from Dulik, M.C., et al., (2012). Mitochondrial DNA and Y chromosome variation provides evidence for a recent common ancestry between Native Americans and indigenous Altaians. *American Journal of Human Genetics* 90, 229–246; used with permission from Elsevier)

Genetic distance analysis using Y-chromosome data shows that Altai-kizhi and Altaian Kazakhs cluster with Mongolians and populations from central East Asia, whereas northern Altaians are distinct from them (Fig. 4.13). The NRY haplogroup distribution described above is the basic reason for this pattern of genetic affinities, but northern and southern Altaians also do not share many of same branches of these particular paternal lineages, such as haplogroup Q. As seen in Fig. 4.14, for haplogroup Q-M346, the precursor of Q-M242, northern Altaian haplotypes are outliers compared to those in southern Altaians and other native Siberian populations. Moreover, a refined SNP analysis revealed that southern Altaian types possess Q-L54 haplotypes that are precursors to the Q-M3 founder haplotypes seen in Native American populations, whereas northern Altaians lack these kinds of Y-chromosomes (Dulik et al. 2012a, b) (see Fig. 4.18).

Yet another reason for the genetic differences between northern and southern Altaians is the greater influence of Mongol expansions on southern Altaians (and Altaian Kazakhs) compared to northern Altaian populations. This is also seen in Central and East Asian populations with the substantial frequency of NRY haplogroup C3c haplotypes in these groups (Abilev et al. 2012; Zerjal et al. 2002; Zhong et al. 2010). In fact, some 16 million men in East Eurasia are estimated to bear Y-chromosomes related to those of Genghis Khan and his male relatives and descendants (Zerjal et al. 2003).

## 4.5 Native American Genetic Prehistory

Over the past 15 years, my laboratory and other research groups have developed a picture of mtDNA variation in the Americas that reflects various aspects of Native American prehistory. As shown in Fig. 4.15, there are five major haplogroups among indigenous populations in the New World (A, B, C, D, and X; now designated A2, B2, C1, D1, X2a). Four are widely distributed throughout the American continents, while the fifth only occurs in North America (Brown et al. 1998; Dornelles et al. 2005; Forster et al. 1996; Kemp and Schurr 2010; Perego et al. 2009; Torroni et al. 1993b). Aside from this intriguing discrepancy, which some have attributed to a secondary expansion into the Americas (e.g., Perego et al. 2009; Achilli et al. 2013), there are also north–south continental differences in

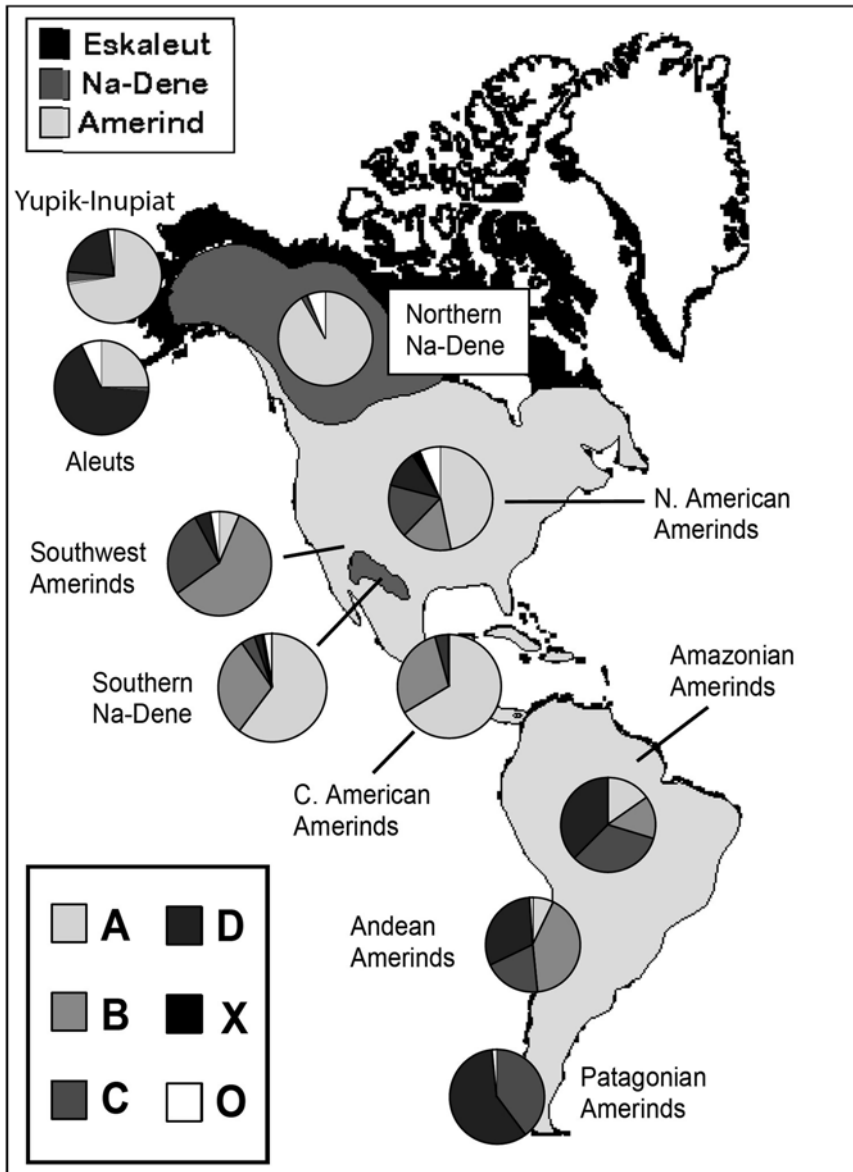


**Fig. 4.14** A reduced median-joining network of 10 loci Y-STR haplotypes for haplogroup Q in southern Siberians (Reprinted from Dulik, M.C., et al., 2012. Mitochondrial DNA and Y chromosome variation provides evidence for a recent common ancestry between Native Americans and indigenous Altaians. *American Journal of Human Genetics*, 90, 229–246; used with permission from Elsevier)

these haplogroup frequencies, ones that have probably arisen through the initial colonization process but also post-settlement population dynamics over the past 10,000 years (Schurr 2004). In addition, we observe that circumarctic populations different from other indigenous groups in the Americas in having predominantly A2, D2, and D3 mtDNAs, probably due to the genetic differentiation of these populations in Beringia after the American continents were first settled (Rubicz et al. 2003, 2010; Schurr 2004; Schurr et al. 1999; Starikovskaya et al. 1998; Tamm et al. 2007; Zlojutro et al. 2006). Furthermore, as noted above, the number of founding haplogroups or lineages that ancestral Native Americans brought with them has expanded with more extensive genetic analyses of indigenous groups from around the Americas (A2, B2, C1b, C1c, C1d, C4c, D1, D4c, D4h3, X2a), with some having more localized distributions than others (Achilli et al. 2008, 2013; Fagundes et al. 2008; Perego et al. 2009, 2010; Schurr 2004; Tamm et al. 2007). Thus, the overall picture of mtDNA diversity in the Americas continues to grow more complicated.

Our work in Alaska and Canada has further provided new information about the history of circumarctic populations. Both the Na-Dene Indians and Inuvialuit populations show a “circumarctic” genetic profile in terms of the predominance of haplogroups A2 and D2 amongst them (Helgason et al. 2006; Rubicz et al. 2003; Saillard et al. 2000; Schurr et al. 1999; Schurr and Wallace 2003; Starikovskaya et al. 1998; Zlojutro et al. 2006) (Fig. 4.16). However, the Inuvialuit have A2a1 and A2b mtDNAs, which are essentially absent in Na-Dene Indians, having arisen in Inuit populations in the past several thousand years (Helgason et al. 2006; Saillard et al. 2000; Schurr et al. 2011; Vilar et al. 2014), as well as D4b mtDNAs (Helgason et al. 2006; Vilar et al. 2014). Similarly, Na-Dene Indians have an A2a5 and C4c mtDNAs that are absent in Eskimo-Aleut-speaking populations (Achilli et al. 2013; Malhi et al. 2008; Schurr et al. 2011; Vilar et al. 2014) and may belong to a

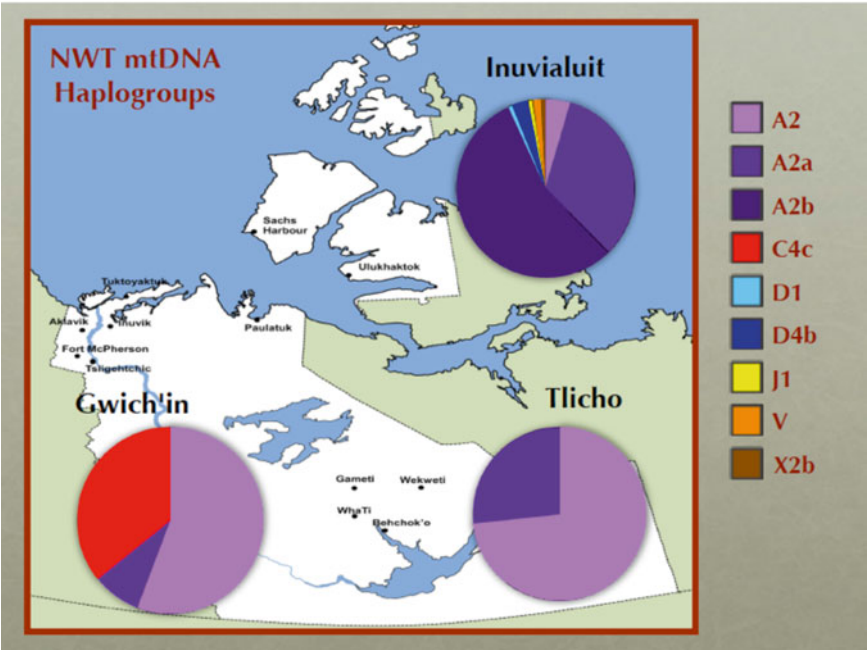




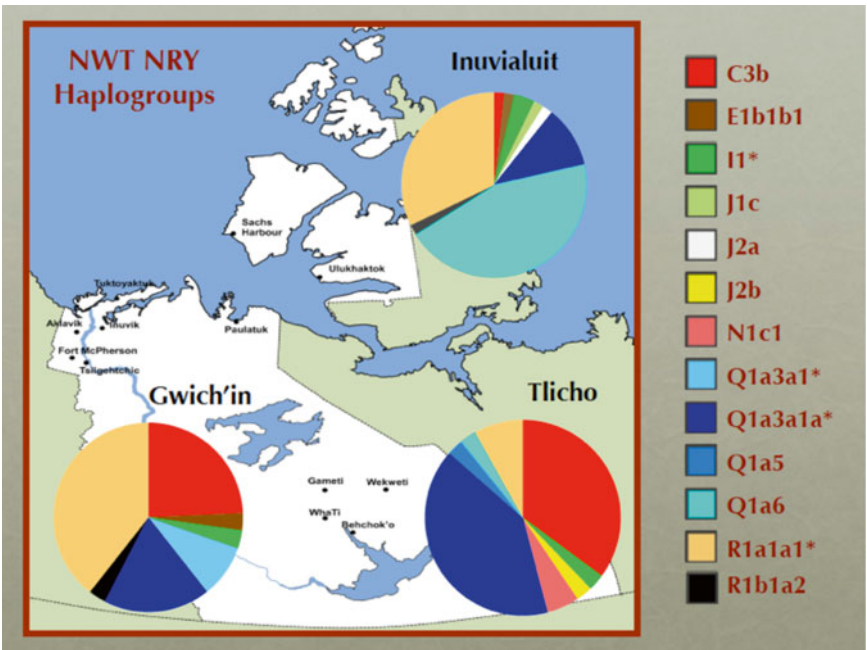
**Fig. 4.15** A map showing the frequencies of the major founding mtDNA haplogroups in the Americas. The main language families in the Americas are shown on the map and indicated by color in the key to the upper left. The mtDNA haplogroups are indicated by color in the key on the lower left. They are now designated as A2, B2, C1, D1 and X2a (Schurr 2004; Tamm et al. 2007; Achilli et al. 2008; Fagundes et al. 2008) (Reprinted from Schurr, T.G. (2004). The peopling of the New World: Perspectives from molecular anthropology. *Annual Review of Anthropology*, 33, 551–583 doi:10.1146/annurev.anthro.33.070203.143932)

distinct lineage arising in the circumarctic region in the past several thousand years. Both show very low frequencies of non-indigenous haplotypes, indicating very little admixture with nonnative populations.

The analysis of Y-chromosome diversity in the Northwest Territories has also added to our knowledge about the human expansion into the Arctic (Fig. 4.17). While both Inuvialuit and Na-Dene

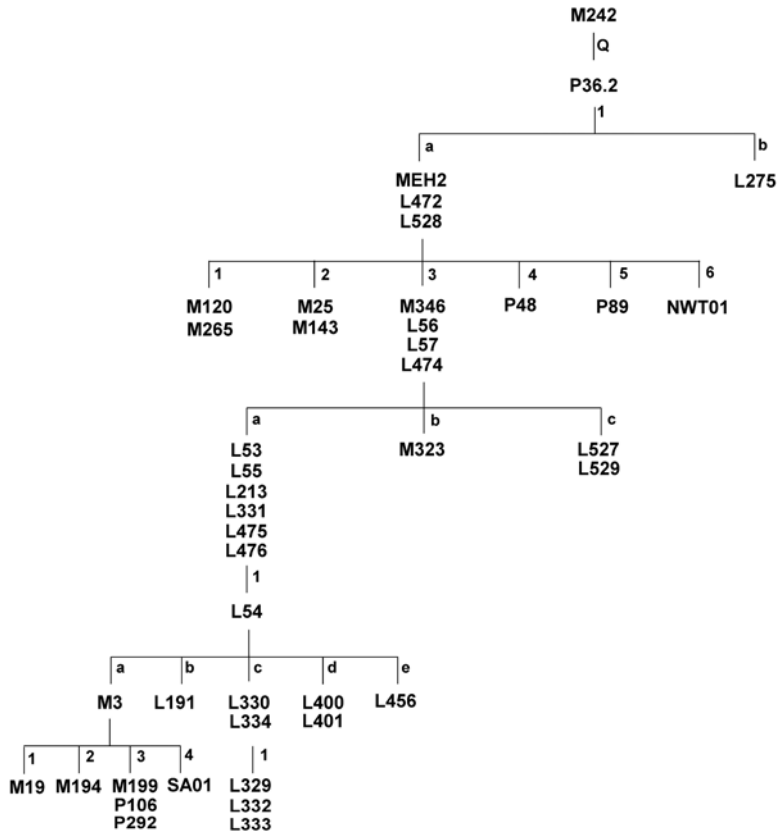


**Fig. 4.16** Frequencies of mtDNA haplogroups in Aboriginal populations of the Northwest Territories, Canada (based on data from Schurr, T.G., et al. (2011) and Vilar, M.G., et al. (2014))



**Fig. 4.17** Frequencies of NRY haplogroups in Aboriginal populations of the Northwest Territories, Canada (based on data from Schurr, T.G., et al. (2011) and Vilar, M.G., et al. (2014))

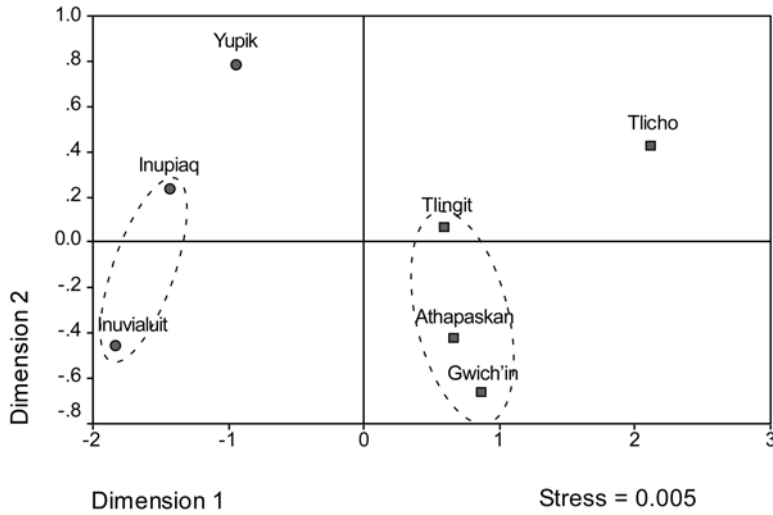




**Fig. 4.18** A revised phylogeny of Y-chromosome haplogroup Q, based on data from East Asian, Siberian and Native American populations. The root of the tree is located at the top, and each descending branch is defined by SNPs (mutations), which are indicated as alphanumeric labels between branches. The small numbers and letters along the branches indicate the naming convention for the haplogroup Q branches, with each step down through the tree adding a letter and number. Thus, the branch defined by the L54 SNP is called Q1a3a1 (starting with M242 and moving downward through each node) (Reprinted from Dulik, M.C., et al. 2012. Y-chromosome analysis reveals genetic divergence and new founding native lineages in Athapaskan- and Eskimoan-speaking populations. *Proceedings of the National Academy of Sciences USA*, 109(22): 8471-8476; used with permission from the National Academy of Sciences)

(Gwich'in and Tlicho) have ~45 % nonnative Y-chromosomes because of historical admixture with largely European individuals (Dulik et al. 2012a), all of them had notable frequencies of the Q-L54 (Q1a3a1\*) and Q-M3 (Q1a3a1a\*) founding lineages. In addition, the Na-Dene had moderate frequencies of C3b haplotypes, with those in the Inuvialuit representing admixture with Na-Dene individuals. In addition, our work has also shown that unique lineages have arisen in the Inuvialuit (Q-NWT101 or Q1a6) and Na-Dene (Q-P89 or Q1a5) after the circumarctic region was colonized in the postglacial period. In fact, Q1a6 appears to demarcate a major expansion of human groups across the Arctic several thousand years ago (Dulik et al. 2012a). Thus, we see some evidence for the common ancestry of these circumarctic groups but also significant genetic differentiation among them, with these patterns aligning with archeological, ethnographic, and linguistic data.

Our recent research in Siberia and the Americas has also yielded new information about the evolution of haplogroup Q. Figure 4.18 shows the phylogeny for haplogroup Q, with its root being positioned at the top of the diagram at the M242 mutation or SNP (Q), and the most recently derived branches at



**Fig. 4.19** A multidimensional scaling (MDS) plot of RST values estimated from Y-STR haplotypes among northern North American populations. The dotted circles enclose populations that share insignificant genetic distances (Reprinted from Dulik, M.C., et al. 2012. Y-chromosome analysis reveals genetic divergence and new founding native lineages in Athapaskan- and Eskimoan-speaking populations. *Proceedings of the National Academy of Sciences USA*, 109(22): 8471–8476; used with permission from the National Academy of Sciences)

the bottom of the tree (e.g., M19 SNP=Q1a3a1a<sup>1</sup>). Some of these branches appear in the Americas, but most are found in Eurasian populations. Our work has shown that, rather than the M346 SNP (Q1a3) representing the ancestral lineage to the Q-M3 lineage (Q1a3a1a) in the Americas (Bortolini et al. 2002, 2003), it is Q-L54 (Q1a3a1) that delineates this precursor (Dulik et al. 2012b). The unique lineages in the Inuvialuit (Q-NWT101 or Q1a6) and Na-Dene (Q-P89 or Q1a5) also branch off of Q1a (Q-MEH2) which with Q1a3 (Q-M346) represent additional founder lineages (Q1a, Q1a3) in indigenous North American populations, with these possibly being brought to North America through secondary gene flow from northeast Asia (Dulik et al. 2012a).

Genetic distance estimates based on NRY haplogroup frequencies further reveal differences between Eskimoan- and Na-Dene-speaking populations, with some differences between populations within these linguistic families also being observed (Fig. 4.19). Eskimoan speakers (Inupiaq and Yupik) cluster together on the left side of the MDS plot (within dotted lined oval) at some distance from all Na-Dene-speaking groups, with Inupiaq and Yupik groups also being distinct from one another. Likewise, most Na-Dene Indian populations show genetic similarities to each other except for the Tlcho, implying some internal differentiation within this linguistic phylum. We are currently exploring these differences in the context of ethnographic, historical, and genetic data.

Our analysis of Y-chromosome variation in Siberia and the Americas has allowed us to evaluate the ages of the Y-chromosome lineages in these two regions (Table 4.1). Q-L54, the ancestral lineage to the unique American Q-M3 has been dated to around 25,000 BP in Siberia and somewhat later in the Americas (e.g., Dulik et al. 2012b). Q-M3 is a more recent lineage, arising in the Americas between 14,000 and 16,000 BP, and then being widely dispersed in the New World with colonizing populations

<sup>1</sup> The nomenclature for the branches of haplogroup Q (its lineages) can be read from top to bottom in this diagram, with each step through the tree being marked by a lower case letter or number. Thus, the branch defined by the M346 SNP is called “Q1a3”, and that defined by the M3 SNP is called “Q1a3a1a.”

**Table 4.1** Ages of Y-chromosome lineages in the Americas

Defining marker (SNP)	Haplogroup	Lineage age
L54	Q-L54 (Q1a3a1*)	19,180±2,650
M3	Q-M3 (Q1a3a1a*)	12,890±2,240
NWT01	Q-NWT01 (Q1a6)	4,030±970
P89	Q-P89 (Q1a5)	~5,000
P39	C-P39 (C3b)	4,900±1,590

*Note:* The shorthand nomenclature for Y-chromosome haplogroups is shown in the “Haplogroup” column, with the more technical names appearing in parentheses after the abbreviated names

(Dulik et al. 2012a; Karafet et al. 2001; Lell et al. 2002; Zegura et al. 2004). The other three lineages all appear to have evolved within circumarctic populations during the Holocene, being essentially unique to Na-Dene (Q1a5 and C3b)- or Eskimo-Aleut (Q1ab)-speaking populations (Dulik et al. 2012a).

4.6 Summary

I will now summarize the results of the studies described in the preceding pages. To begin with, the initial settlement of the Altai-Sayan region (south-central Siberia) occurred between 30,000 and 40,000 BP, as modern humans began colonizing different parts of Eurasia. Analysis of Y-chromosome haplogroup Q shows connections between populations of the New and Old Worlds, indicating that southern Altaians and Native Americans shared a common genetic ancestor some 20,000–25,000 BP. This is also implied by the recent ancient DNA studies of the Mal’ta Boy and Anzick Child, which revealed a significant West Eurasian contribution to the genetic makeup of ancestral Native American populations prior to their expansion into Beringia (Raghavan et al. 2013; Rasmussen et al. 2014). In addition, NRY haplogroup D and mtDNA haplogroup D5c in Altaians genetically link them to Japanese and Koreans (even Tibetans), affirming purported connections between Altaic (Transeurasian) speakers. On a more local level, northern Altaians appear to show genetic affinities with Yeniseian, Ugric, and Samoyedic speakers to the north, whereas southern Altaians have greater affinities to other Turkic-speaking populations of southern Siberia and Central Asia. There is also a strong paternal genetic influence of Mongols (NRY haplogroups C3c and O3e) on southern Altaians and Altaian Kazakhs, but not northern Altaians. Like other Central Asian and native Altaian populations, Kazakhs show considerable mtDNA diversity (both East and West Eurasian lineages) but more limited NRY variation, a pattern reflecting both the historic formation of this ethnic group and the effects of patrilocality on patterns of genetic diversity within it.

On the opposite side of Beringia, the initial expansion into the New World appears to have occurred between 15,000 and 20,000 BP. Most genetic data supports a single major expansion into the Americas giving rise to Amerindian populations after the genetic differentiation of their ancestral populations, although there are still some details about this process to resolve. Secondary expansions into North America by ancestral populations of Eskimo-Aleuts and Athapaskan Indians occurred during the last 10,000 years (see Reich et al. (2012) for a discussion of the autosomal genetic view of this migration history). These circumarctic populations show genetically distinct patterns of mtDNA and Y-chromosome diversity from Amerindian populations to the south, implying a somewhat different evolutionary trajectory for them. New founder NRY lineages, Q1a5 and Q1a6, identified in Inuvialuit and Athapaskan populations, respectively, also reflect the genetic differentiation of these ethnolinguistic groups during the past several thousand years. Furthermore, new mtDNA and NRY data from populations living around the Americas indicate the existence of more founding maternal and paternal lineages than previously appreciated, suggesting a more complex colonization process than earlier models proposed.

**Acknowledgments** I would like to thank the Permanent Delegation of Kazakhstan to the UNESCO, the Embassy of the Republic of Kazakhstan to the United States of America, and the Harriman Institute and the East Central European Center at Columbia University for their sponsorship of the Great Migrations conference. Many thanks to the Altaian, Kazakh, Mongolian, and Native American individuals who participated in the studies described in this chapter; without their involvement, the insights discussed in the text could not have been obtained. I would also like to thank the individuals from my research team who contributed to the Altaian and Native American studies described in this chapter, including Matthew Dulik, Amanda Owings, Jill Gaieski, Sergey Zhadanov, Miguel Vilar, Omer Gokcumen, Ayken Askapuli, Lydia Gau, Athma Pai, Samara Rubinstein, and Lenore Pipes. In addition, I wish to express my gratitude to collaborators in the USA, Canada, and Russia for their involvement in this research, including Drs. Ludmila Osipova, Damian Labuda, Ingrid Kritsch, Tom Andrews, Jim Martin, Nancy Gibson, Judy Ramos, Mary Beth Moss, Francis Natkong, Alestine Andre, Crystal Lennie, and Mary Adele Mackenzie. The work discussed in this chapter was facilitated and supported by a number of organizations, including the Tlicho First Nation, Gwich'in First Nation, Inuvialuit Regional Corporation, the Prince of Wales Northern Heritage Centre, Millbrook First Nation, Indian Brook First Nation in Canada, Yakutat Tlingit Tribe, Hoonah Tlingit Tribe, Hydaburg Cooperative Association, Huna Indian Association, Huna Heritage Foundation, Bear River Rancheria of Rohnerville, Wiyot Tribe, Seaconke Wampanoag Tribe in the United States, and the Institute of Cytology and Genetics in Novosibirsk, Russia. Janet Ziegler from Applied Biosystems provided technical support for our DNA analysis as part of the Genographic Project. Finally, I would like to acknowledge the financial support of a number of funding agencies for the research that is summarized in this chapter, including the National Science Foundation (USA), National Geographic Society, Waitt Family Foundation, IBM, IFOND (Russia), SSHRC (Canada), University of Pennsylvania, and the University of Pennsylvania Museum of Archeology and Anthropology.

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# Chapter 5

## Stemmed Points, the Coastal Migration Theory, and the Peopling of the Americas

Jon M. Erlandson and Todd J. Braje

### 5.1 Introduction

The discovery and dating of the Monte Verde II site in Chile to ca. 14,000 calendar years ago (Dillehay 1989, 1999; Dillehay et al. 2008; Erlandson et al. 2008a), combined with an accumulation of genetic evidence (e.g., Fagundes et al. 2008; Kemp et al. 2007; Kitchen et al. 2008), has forced archaeologists to reexamine long held paradigms about when and how the New World was first colonized. Evidence for pre-Clovis occupations at Paisley Caves in Oregon (Gilbert et al. 2008; Hockett and Jenkins 2013; Jenkins et al. 2012), the Manis Mastodon site in western Washington (Waters et al. 2011b), and a handful of other sites has confirmed the presence of Paleo-American peoples in the New World prior to the widespread technological phenomenon known as Clovis, but much remains to be learned about the origins, migration patterns, and adaptations of the First Americans.

After over a decade of reinvigorated Paleoindian research, most archaeologists now agree that: (1) the Americas were first settled between ca. 14,000 and 20,000 years ago; (2) Paleoindians using Clovis technologies inhabited continental North America from the Pacific Coast to the Atlantic Seaboard, by 13,000–12,500 cal BP; (3) part of the Clovis subsistence economy included the hunting of terrestrial megafauna with fluted projectile points; (4) Clovis may be the first widely recognized cultural horizon in North America, but they were not the first colonizers; and (5) the First Americans originated from somewhere in northeast Asia (see Goebel et al. 2008; Pitblado 2011; Waters and Stafford 2007; Waguespack and Surovell 2003; Wheat 2012).

Certain scholars still dispute some of these claims (e.g., Lohse et al. 2014; Stanford and Bradley 2012; see Eren et al. 2013 for a critical response to these disputes), but most Paleoindian researchers are currently working from these assumptions and consider the ice-free corridor and the Pacific Coast as the most likely routes of entry by pre-Clovis groups. Some interpretations of linguistic data from modern Native American populations suggest a Pacific Coast entry into the New World between 20,000 and 40,000 cal BP (Nichols 1990, 1992, 1994; see Chap. 9 for further discussion), but rates of language divergence are exceptionally difficult to calculate. Dental and cranial morphometric studies by physical anthropologists, as well as both ancient and modern DNA studies, suggest that the First Americans came from a northeast Asian population (see Fagundes et al. 2008; Kemp et al. 2007; Rasmussen et al. 2014), but there is no clear consensus about the number, timing, and speed of migrations.

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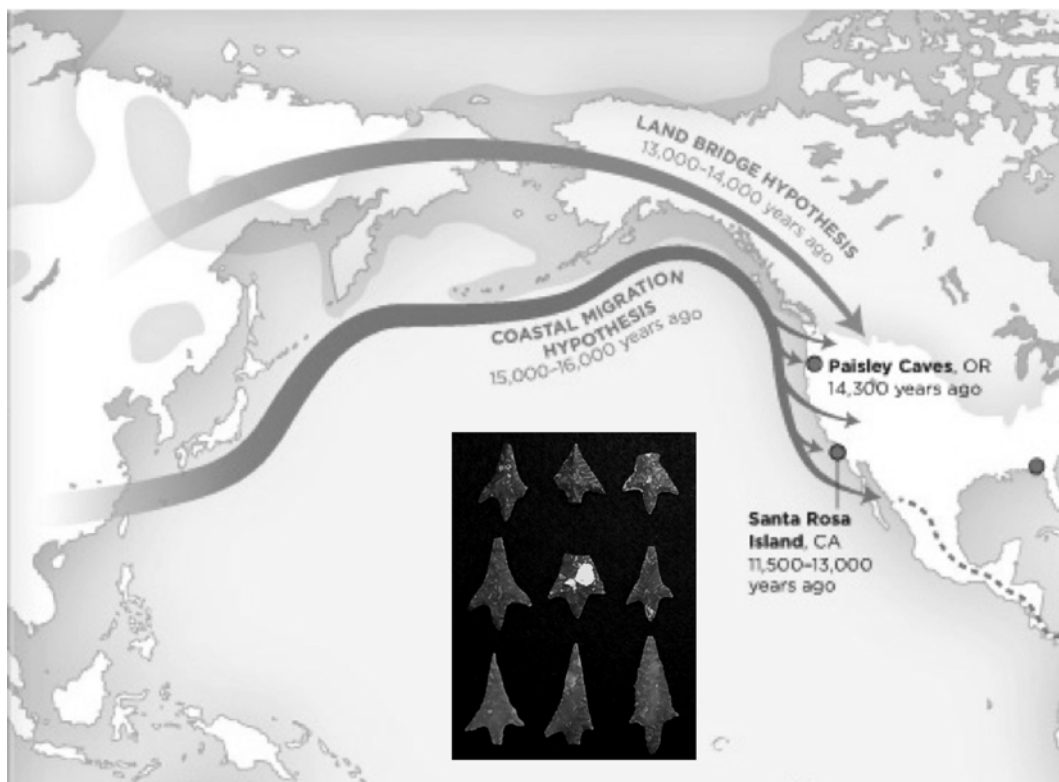
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Finding direct archaeological evidence of the initial migration route or routes into the New World presents a number of unique taphonomic challenges. Most notably, sea levels have risen between 100 and 125 m since the Last Glacial Maximum (LGM) ca. 20,000 years ago (Erlandson 2002:301; Yokoyama et al. 2000), submerging a vast coastal paleolandscape that would likely have been the primary terrestrial foraging and settlement area for Paleoindian mariners. The opening of the ice-free corridor and its suitability for human migration has also been a major point of contention, with some researchers suggesting deglaciation by 15,000 cal BP (e.g., Munyikwa et al. 2011), which could account for Monte Verde II and other widely accepted pre-Clovis sites (Paisley Caves, Manis, etc.) or not until after 14,000 years ago (Dyke et al. 2002), which would preclude a pre-Clovis ice-free corridor route. Palynology studies further complicate the story, with some researchers arguing that the corridor was not a viable human migration route until 13,000 cal BP, after the first appearance of Clovis in continental North America (see Arnold 2002). Currently, there are no archaeological sites older than Clovis found within the ice-free corridor, and the few fluted points identified in Alaska and the Yukon are younger than continental Clovis and largely regarded as part of a later northward migration up the corridor (see Fladmark et al. 1988; Goebel et al. 2013; Waters and Stafford 2007).

One of the ways archaeologists can and have contributed to New World colonization research is helping to identify and define the pre-Clovis toolkit or kits and tracking their appearance and evolution from the Old to New Worlds. This avenue of research is challenging and recent discoveries suggest it will continue to be just that. Pre-Clovis hunting of mastodon at the Manis site in Washington suggests the use of a perishable bone technology (Waters et al. 2011b), for example, and the large pre-Clovis artifact assemblage at the Friedkin site in Texas has produced no diagnostic tools (Jennings and Waters 2014; Waters et al. 2011a; for a critical assessment see Morrow et al. 2012). Recently, however, Beck and Jones (2010) reinvigorated a long-standing debate about the relative antiquity of early stemmed versus fluted point traditions in western North America. They hypothesized that some early Western Stemmed points are as old or older than Clovis and may be markers of a coastal migration from northeast Asia into the Americas. Jenkins et al. (2012) provided support for the antiquity of Western Stemmed points, showing that they were at least as old as Clovis in deeply stratified deposits at Paisley Caves, where no evidence of Clovis technology was found.

The potential connection of the Western Stemmed tradition to a coastal migration is also supported by the distribution of distinctive tanged or stemmed point technologies in Late Pleistocene assemblages around the Pacific Rim (see Erlandson and Braje 2011)—from the Incipient Jomon of Japan dated as early as 16,000 cal BP, Ushki Lake in Kamchatka dated to ca. 13,500 cal BP, several Paleocoastal sites on California's Northern Channel Islands dated between 12,200 and 11,600 cal BP (Erlandson et al. 2011; Fig. 5.1), and early stemmed point types found in South America (Erlandson and Braje 2011; Roosevelt et al. 1996). Unlike fluted point traditions, which have no clear precursors in northeast Asia or Beringia, these widely scattered stemmed point traditions provide a plausible technological trail for people moving from northeast Asia to the Americas, one that may have been largely obscured by rising postglacial sea levels.

American archaeologists have debated the relative antiquity and meaning of fluted versus stemmed projectile points in western North America for decades. Beck and Jones (2010) added to a growing body of archaeological and genetic evidence noting that the peopling of the Americas was a more complex and interesting process than the Clovis-first model suggested. Although the dominant view for many years has been that the Western Stemmed tradition (i.e., Lind Coulee, Windust, Lake Mojave, and other varieties) was derived from Clovis, this view is no longer supported by the available evidence. Beck and Jones (2010) were not the first scholars to suggest a separate northeast Asian origin for Western Stemmed point traditions (see Dikov 1979), but they were among the first to explicitly link such points to the coastal migration theory. Their thesis, that the makers of Western Stemmed and Clovis-like points represent two separate cultural traditions that later intermingled in the far west of North America, resonates with us as it seems consistent with recent research by Jenkins et al. (2012) in Oregon and on our own work on California's Channel Islands (Erlandson and Braje 2011; Erlandson et al. 2011).



**Fig. 5.1** Map depicting possible human migration routes into the New World and two locations where distinctive, early stemmed point technologies have been found. *Inset:* Examples of stemmed points found during excavations on Santa Rosa Island

For decades, American archaeologists have searched—largely in vain—for a logical northeast Asian precursor to Clovis and other fluted point traditions in North America. Focused primarily on western North America, Beck and Jones (2010) dealt only briefly with possible Asian precursors to stemmed point traditions of North America, looking at pre-LGM assemblages at Ust'-Kova and Yana RHS in Siberia that lie far from the Pacific Coast. As they note, however, recent genetic evidence argues for both a more recent migration into the Americas (ca. 15,000–16,000 cal BP) and links between human populations in eastern China and the west coasts of North and South America (Beck and Jones 2010:105; Kemp et al. 2007; Perego et al. 2009). These links are related to the mtDNA haplotype D, variants of which (e.g., D1, D1g, D1j, D4b2, D4h2, D4h3a) have been found in ancient Jomon skeletons in Japan (Adachi et al. 2013), in the On Your Knees Cave Man in southeast Alaska (Kemp et al. 2007), the Anzick Clovis burial in Montana (Rasmussen et al. 2014), the Hoyo Negro skeleton found in a submerged cave on the Yucatan Peninsula (Chatters et al. 2014), and among living Native Americans clustered along the Pacific Coasts of North and South America and the southern cone region of South America (Bodner et al. 2012).

Here, we briefly summarize the evidence for the distribution and antiquity of early stemmed point traditions from northeast Asia and the Americas, a Pacific Rim pattern that is quite similar to the genomic distribution of haplotype D. Our synthesis sheds new light on the possible connections between early technologies and human migration. These data support two key points made by Beck and Jones (2010): (1) that Western Stemmed points predate fluted points in far western North America; and (2) that stemmed point traditions around the Pacific Rim may well be linked to a coastal migration of Upper Paleolithic peoples from northeast Asia into the Americas.

## 5.2 Pacific Rim Stemmed Point Technologies

Stemmed points dating to the terminal Pleistocene have been recovered from a variety of geographic areas around the Pacific Rim: from Japan, Sakhalin Island, and Kamchatka, to northwestern North America, islands off Alta and Baja California, virtually the entire Andean Coast, and the Amazon Basin. All these lithic traditions are characterized by shouldered and stemmed (or “tanged”) projectile points found in either coastal settings or peri-coastal locations on or near major river drainages.

### 5.2.1 *Northeast Asia*

Stemmed and shouldered points have been found in Upper Paleolithic sites on the Korean Peninsula dated from over 35,000 to 15,000 years ago, some associated with blades and others with microblades (Seong 2008). The Korean points are often thin, with relatively long stems, but most are made on flakes with only marginal retouch. More distinctive and bifacially flaked stemmed points, some with prominent barbs, are found in numerous Incipient Jomon sites throughout Japan, in contexts dated from ca. 15,500 to 13,800 cal BP (see Nagai 2007; Vasilevski 2005:434). These points, often associated with leaf-shaped bifaces, are relatively thin and finely made, often with long stems and prominent barbs. Over 1,500 of these “tanged” points have been recovered in Japan and classified into regional and temporal types based on shape, flaking pattern, raw material, and other traits (see Nagai 2007).

Points similar to the Incipient Jomon examples have also been found on Sakhalin Island (Nagai 2007), which was once part of a peninsula connecting northern Japan to the Asian mainland, at the Ushki Lake site complex in Kamchatka, and a few other poorly dated sites in northeast Asia. At Ushki, Dikov (1979) found numerous bifacially flaked stemmed points in a stratum initially dated to roughly 16,000 cal BP, but later redated to about 13,000 cal BP (Goebel et al. 2003). This component produced no microblades but numerous “flake and blade tools and small bifacial points and knives” (Goebel et al. 2003:504). Powers (1996:234) suggested that this Ushki Lake assemblage was “an anomaly for the Siberian Upper Paleolithic” with relationships to Japan, possibly through a “direct maritime connection through the Kuril Islands.”

### 5.2.2 *Western North America*

There is a large gap in the distribution of early coastal sites and stemmed points from Kamchatka to the Northwest Coast of North America. This gap corresponds to the submerged southern shoreline of Beringia, the Aleutians where no evidence of Pleistocene human occupation has been found, and the heavily glaciated coastlines of south-central and southeast Alaska. Along the dynamic coast of northwestern North America, there is still only limited evidence for a terminal Pleistocene human occupation and those sites that have been identified have produced relatively small assemblages of formal tools (see Erlandson et al. 2008b; Fedje and Mathewes 2005; Fedje et al. 2004). The oldest sites in this area often contain leaf-shaped bifacial points, some with subtle shoulders and stems, followed by a later appearance of microblades. On the southern Northwest Coast, from southern Vancouver Island to northern California, very few early coastal sites have been identified, probably due to coastal erosion and a long history of massive subsidence earthquakes and tsunamis along the Cascadia Subduction Zone (Erlandson et al. 2008b).

Beck and Jones (2010:101) noted the presence of stemmed points in several Pacific Northwest sites dated between about ca. 13,300 and 12,500 cal BP, including a specimen found beneath the skull of

the Buhl burial (dated to ca. 12,600 cal BP) that is similar to stemmed points from Ushki Lake. All these Pacific Northwest sites fall on or near major river systems such as the Columbia and Klamath, which may have provided productive aquatic migration corridors that coastal peoples could easily have followed deep into the interior of the Intermountain West. Recent excavations and dating efforts at Oregon's Paisley Caves add to the evidence for the antiquity of the Western Stemmed point technology in northwestern North America. In pre-Clovis deposits yielding human coprolites (containing traces of human DNA) and artifacts firmly dated between ca. 14,400 and 14,000 cal BP no fluted points, blades, or other Clovis-like artifacts have been found (Gilbert et al. 2008; Jenkins 2007; Jenkins et al. 2012). Several stemmed point fragments were recovered in the overlying strata dated to Clovis times or slightly earlier (Jenkins et al. 2012), supporting Beck and Jones' (2010) conclusion that stemmed points predate fluted points in the Pacific Northwest.

Compared to the Northwest Coast, the shorelines of Alta and Baja California have produced extensive evidence for early occupation, ranging from occasional fluted Clovis-like points to scores of shell middens dated between about 12,000 and 8,000 cal BP (see Erlandson et al. 2008b). On the Northern Channel Islands, recent research has identified a sophisticated Paleocoastal chipped stone technology featuring crescents and delicate stemmed, barbed, and/or serrated points (Glassow et al. 2008; Erlandson and Jew 2009; Erlandson et al. 2011). Long thought to date to the late Holocene (Justice 2002), recent research has shown that these Channel Island Barbed points date between at least 12,000 and 8,000 cal BP (Erlandson et al. 2011). One specimen found several decades ago deep in the sequence at Daisy Cave was attributed to a general Paleocoastal occupation (Erlandson and Jew 2009:158), but recent analysis of the excavation notes suggests that it probably dates to ca. 11,500 cal BP. Stemmed points have also been found associated with chipped stone crescents and several shell middens dated between ca. 12,200 and 11,400 cal BP (Erlandson and Braje 2008; Erlandson et al. 2011). Others are associated with Paleocoastal middens dated between ca. 9,600 and 8,000 cal BP (Braje 2010; Erlandson and Braje 2007; Erlandson et al. 2005; Glassow et al. 2008, 2014). The co-occurrence of stemmed points and crescents provides technological links between Paleocoastal and Paleoindian peoples in the western North America (Erlandson et al. 2011).

On Cedros Island off Baja California's Pacific Coast, Des Lauriers (2006) recovered hundreds of bifaces from PAIC-44 and -49, two shell middens dated between about 12,000 and 9,300 cal BP. The bifaces from PAIC-44 include numerous preforms, leaf-shaped specimens, a basally thinned stemmed point, and a weakly shouldered point, which Des Lauriers (2006:265–266) suggested may have been used to hunt the sea turtles and sea mammals represented in the midden.

### 5.2.3 *South America*

We are less familiar with South American records, but stemmed points and leaf-shaped bifaces dated to the terminal Pleistocene have been identified along the Andean Coast of Ecuador, Peru, and Chile, as well as much of the remainder of the continent (see Lynch 1986; Maggard 2010; Roosevelt et al. 1996; Scheinsohn 2003). Stemmed "fishtail" points, some with fluted bases, are widely distributed, and those found in datable contexts appear to be between about 14,000 and 11,000 years old (Bruhns 1994:48). Along the Andean Coast, a small stemmed point was found in a terminal Pleistocene context at the Quebrada Jaguay site in Peru (Sandweiss et al. 1998). Finely flaked Paiján points have been found along the coastal plain of northern Peru (Scheinsohn 2003:346), some with barbed shoulders and contracting stems. Stemmed "Punta Negra" points also come from several sites in Chile's Atacama Desert (Lynch 1986:154–155), which Grosjean et al. (2005) dated between ca. 12,600 and 10,200 cal BP.

Projectile points with distinctive barbs and contracting stems have also been found in Columbia, Venezuela, Guyana, and Brazil (Barse 1997:1949) and a stemmed point preform was recovered from cultural deposits dated between ca. 13,000 and 12,000 cal BP at Pedra Pintada in the Amazon Basin

(Roosevelt et al. 1996). The widespread distribution of stemmed points in South America along marine coastlines and interior freshwater drainages suggests a similar pattern of coastal colonization of Central and South America as seen along western North America. Continued research, including careful redating of stemmed points from stratified sites in South America (a process that has taken decades in North America and is still ongoing), may demonstrate that early coastal migrants crossed the narrow Isthmus of Panama and spread along both the Atlantic and Pacific coasts, as well as up major river systems (see Chap. 7 for a broader discussion of South American evidence).

### 5.3 Discussion

In the last decade or two, the coastal migration theory has gone from marginal to mainstream, a transformation fueled by: (1) growing evidence for the presence of seafaring and maritime peoples in eastern Asia before the LGM; (2) the growing awareness of the antiquity of human settlement and maritime activity along the Pacific Coast of the Americas (e.g., Dillehay et al. 2008; Erlandson 2002; Johnson et al. 2002; Keefer et al. 1998; Sandweiss et al. 1998); (3) widespread scholarly acceptance of pre-Clovis occupations ( $\geq 14,000$  cal BP) at Paisley Caves in Oregon and Monte Verde near Chile's Pacific Coast; and (4) evidence that a passage along the Northwest Coast of North America opened significantly earlier than the ice-free corridor (see Mandryk et al. 2001). These discoveries have returned the Pacific Rim to center stage in debates about the peopling of the Americas and expanded the search for early coastal archaeological sites (Dixon 1999).

Archaeologists looking for terminal Pleistocene sites along Pacific Rim coastlines face imposing geological obstacles, however, including postglacial sea level rise, glaciations, coastal erosion, and dramatic landscape changes. The archaeological record of Late Pleistocene occupations is fundamentally flawed, in fact, due to postglacial sea level rise of  $\sim 100$ – $125$  m and the worldwide flooding of paleocoastlines and coastal lowlands. From Japan to Alaska and the Pacific Coasts of North and South America, a combination of global, regional, and local processes affect the preservation and visibility of coastal archaeological sites.

Nonetheless, the geography of Pacific Rim shorelines is united by its generally mountainous terrain and steep bathymetry, tectonic and volcanic activity, climates ameliorated by the Pacific Ocean, coastlines that offered no significant physical barriers to migrations or information exchange by maritime peoples since shortly after the end of the LGM (Erlandson et al. 2007). Much of the Pacific Rim is also characterized by marine upwelling, productive marine food webs, and an essentially continuous mosaic of rocky intertidal, kelp forest, sandy beach, and estuarine ecosystems. From Japan to Baja California, these include (or once included): seals, sea lions, sea otters, and cetaceans; abalones, mussels, clams, sea urchins, and limpets; rockfish, sharks and rays, sardines, and other fish; seabirds, shorebirds, and waterfowl; and edible seaweeds. When combined with the plants and animals available in adjacent terrestrial and freshwater ecosystems, the pristine habitats of the Pacific Rim would have provided a stable foundation for population growth and geographic expansion. The exploration and settlement of major rivers around the Pacific Rim would have drawn humans into productive interior areas, where their presence was more likely to survive the effects of rapid postglacial sea level rise and associated coastal erosion.

### 5.4 Conclusions

One of the more recent criticisms of the coastal migration theory is that early sites along the Pacific Coast of North America lack coherent technological assemblages or evidence for a substantial commitment to maritime lifeways (Yesner et al. 2004:198). Beck and Jones (2010) and Jenkins et al. (2012)



have demonstrated the antiquity of stemmed points in western North America, making a strong case that this tradition is separate from Clovis traditions, of equal or greater age, and may be related to an early coastal migration originating in northeast Asia. The recent discovery of stemmed points and crescents in Paleocoastal shell middens on the Channel Islands, as well as stemmed points and marine vertebrates on Cedros Island, provides technological assemblages and evidence for seafaring and marine resource use consistent with other data from northeast Asia and South America that support the viability of the coastal migration theory and add a plausible migration route to Beck and Jones' (2010) thesis. Around the Pacific Rim, there continue to be large gaps in the archaeological evidence for Late Pleistocene coastal settlement and marine resource use, but these should be expected given the region's history of glaciation, tectonics, sea level rise, marine erosion, and landscape change. Under the circumstances, what is remarkable is that the Pacific Rim still offers a more coherent record of technological traditions linking the early peoples of northeast Asia to North and South America than the ice-free corridor and interior migration routes. This record is seen in a discontinuous trail of stemmed points extending from Japan and Kamchatka, through western North America, to the Andean Coast and the Amazon Basin—an archaeological record that is remarkably similar to some recent genetic reconstructions that appear to support the coastal migration theory.

**Acknowledgements** Our research on the Channel Islands and North Pacific Rim has been graciously supported by the National Science Foundation, the National Park Service, and our home institutions. Special thanks to the Permanent Delegation of the Republic of Kazakhstan to UNESCO, the Embassy of the Republic of Kazakhstan to the United States, and the Harriman Institute of Columbia University for organizing the Second International Conference on the Great Migrations, inviting us to participate, funding the conference, and hosting the event. We also thank Michael Frachetti, Robert Spengler, and the staff at Springer for their editorial assistance and taking on the heavy lifting of pulling this volume together.

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# Chapter 6

## The Initial Colonization of North America: Sea Level Change, Shoreline Movement, and Great Migrations

David G. Anderson and Thaddeus G. Bissett

### 6.1 Introduction

The human settlement of the New World is one of the truly great migrations in our species' history. When the first peoples arrived is currently unknown, with estimates varying widely, from upwards of 25,000 calendar years ago, or cal year BP, to as recently as 14,000–15,000 years ago, when well-documented sites have been found at both ends of the hemisphere, in Alaska and near the southern tip of South America, as well as at a number of locations in between. At present, however, our understanding of how these first peoples got here, that is, the routes that they took, as well as what they did once they settled in particular areas, is only beginning to be understood. Existing colonization and settlement models are profoundly shaped by climatic and physiographic conditions, such as the location of ice sheets, oceans, periglacial and pluvial lakes, drainage systems, mountain ranges and passes, and exploitable biota. In this chapter we examine how people may have migrated into the Americas and the routes they may have taken, with particular emphasis on how the dramatic changes in sea level and shorelines that occurred in the Late Pleistocene could have shaped where people moved and settled on the landscape.

People were present in fairly large numbers across much of North America by about 13,000 cal year BP, as documented by the widespread presence of sites and isolated finds characterized by fluted projectile points of the Clovis cultural tradition (Fig. 6.1). While earlier sites are known and several are widely accepted in the Americas prior to this time, they constitute a mere handful compared to the number of fluted point sites and isolated finds, which are reported from over 1,600 discrete locations ranging from Alaska to well into Latin America (Anderson et al. 2010a; Faught 2008; Miller et al. 2013). When Clovis began is currently unknown, although analyses of dated sites suggest a likely range from ca. 13,250 to 12,850 cal year BP, at the end of the Bølling-Allerød warm period or interstadial, to at or soon after the onset of the Younger Dryas cold reversal (Waters and Stafford 2007:1123). The origin of Clovis is currently poorly understood both in terms of dating and possible cultural precursors, although it may have begun several centuries earlier than the beginning date of 13,250 cal year BP proposed by Waters and Stafford, given the presence of sites with somewhat earlier dates like Aubrey and Debra L. Friedkin in Texas and Fin del Mundo in Sonora (Ferring 1995, 2001;

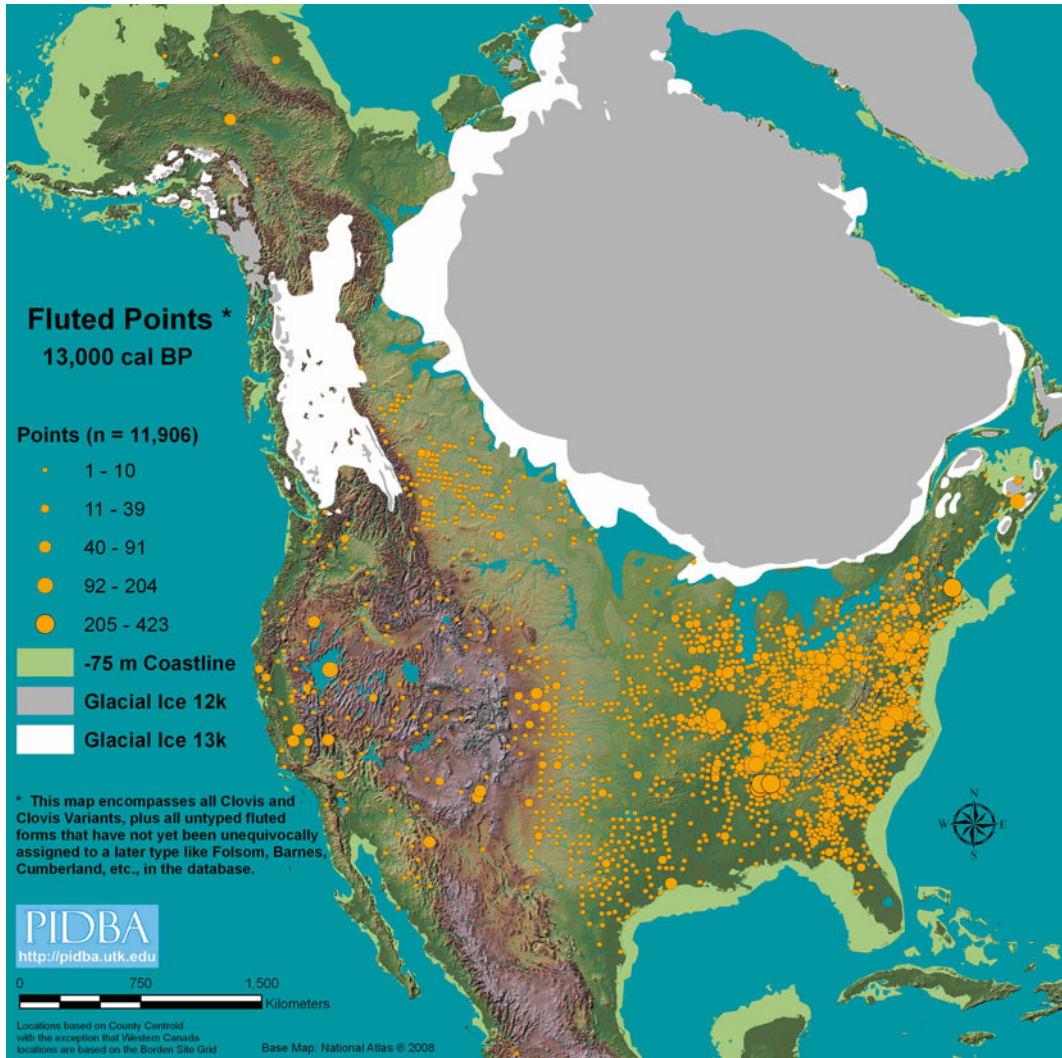
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**Fig. 6.1** Evidence for human settlement is widespread soon after 13,000 cal year BP in North America. The map depicts locations yielding fluted Clovis and related forms, plus untyped points designated as “fluted” in Paleoindian artifact recording projects but not yet assigned to a specific later type like Barnes, Cumberland, Folsom, Gainey, Redstone, etc., in PIDBA (Paleoindian Database of the Americas; <http://pidba.utk.edu/main.htm>). Some of the illustrated locations are clearly post-Clovis in age, particularly in the northern part of the continent (Image prepared by Stephen Yerka, adopted from Anderson et al. 2010a; glacial margins from Dyke et al. 2003)

Miller et al. 2013; Sanchez et al. 2014; Waters et al. 2011a). A recent analysis of dated sites (Miller et al. 2013:215), in fact, suggests a somewhat broader range than that proposed by Waters and Stafford, from ca. 14,400 to ca. 12,700 cal year BP; Prasciunas and Surovell (2015) argue any precise dating of Clovis is premature given our current samples. The end of the Younger Dryas chronozone at about 11,700 cal year BP by geological convention marks the onset of the modern or Holocene epoch, and is a clearly demarcated climatic signature (Walker et al. 2009). These climatic and cultural episodes and boundaries offer a convenient means of partitioning Pleistocene human occupations in North America into three major periods, the Early Paleoindian or “Exploration” period (Waters and Stafford 2013), the Middle Paleoindian or Clovis period, and the Late Paleoindian period, corresponding to the

Younger Dryas chronozone (Anderson et al. 2015); as Clovis origins are better understood, as well as the beginning and ending of the Younger Dryas is more precisely dated, refinement of specific date ranges for these periods will occur.

## 6.2 Major New World Colonization Models

The location of Early Paleoindian sites has helped shape thinking about possible entry methods and routes into the Americas. Three colonization scenarios have received the most professional as well as public attention in recent years: (1) movement overland and on foot from northeast Asia across Beringia—the now-submerged land bridge in the vicinity of the Bering Strait separating Asia from North America—and from there south into the interior of North America on foot through openings in the ice sheets covering Canada (Haynes 1969; Martin 1973), (2) movement by watercraft along the southern margin of this same land bridge and on down the Pacific coast of North, Central, and South America (Dixon 1999; Erlandson 2002; Erlandson et al. 2007, 2008; Fladmark 1979; Mackie et al. 2013), and (3) movement from western Europe by watercraft across the north Atlantic along the margins of the ice pack (Stanford and Bradley 2002, 2012). Some of these proposals are more controversial than others, notably the “Ice Edge” or “Atlantic Ice” scenario, about which debate shows no sign of abating (cf. Eren et al. 2014; Lohse et al. 2013; O’Brien et al. 2014; Stanford and Stenger 2014; Straus et al. 2005). While genetic evidence indicate modern Native Americans were descended from Pleistocene age forbears of probable East Asian origin (Chatters et al. 2014; Kemp and Schurr 2010; O’Rourke 2011; Rasmussen et al. 2014; Schurr, Chap. 4 herein)—rendering appropriate the use of the term Paleoindian for these first peoples as we do here—much work remains to be done before we understand the colonization process with any degree of certainty. Once reaching areas devoid of ice sheets—which were likely impassable beyond short stretches due to crevices and lack of exploitable biota—movement would have proceeded on foot or by watercraft both along the coast and in the interior. Beyond these broad outlines, movement patterns during entry and early settlement of the Americas are obscure, although a number of routes or segments of routes have been proposed and are discussed below.

Perhaps the most famous Early Paleoindian site in the Americas that for over two decades has been shaping debate about colonization models is Monte Verde. Located in Chile near the southern tip of South America, and about 50 km from the Pacific Ocean, the site has produced a remarkably well-preserved assemblage of remains coming from both coastal and interior sources, and dates to ca. 14,800 cal year BP (Dillehay 1997, 2000; Dillehay et al. 2008). As the site’s antiquity came to be widely accepted within the professional archaeological community (e.g., Meltzer et al. 1997; Wheat 2012), its location—at the opposite end of the hemisphere from presumed initial points of entry—necessitated major rethinking of earlier colonization models. With the discovery of megafaunal kill sites in the central and southern Plains in the 1920s and 1930s, and large numbers of fluted points in the same areas, it was logical to assume that people had likely moved into the Americas on foot and overland, possibly assisted by dogs (Fiedel 2005), through central Beringia and then southward through an opening that appeared in the ice sheets covering Canada toward the end of the Late Pleistocene (Cotter 1937:34; Haynes 1964, 1969; Johnston 1933; Sauer 1944:555). By the 1960s this had become the standard model for the colonization of interior North America, and given the evidence available at the time, this overland, ice-free corridor entry route made considerable sense. This entry route came to be associated with the so-called *Clovis-first* colonization model, which assumed that the peoples making Clovis artifacts were the first to settle in the Americas south of the ice sheets, given the widespread occurrence of this technology about the time the corridor was assumed to have opened (see reviews of the rise and demise of this model in Dillehay 2000; Pitblado 2011; Stanford et al. 2005; Waters and Stafford 2013). The origins of Clovis technology, and whether it even existed



when the corridor was traversable, however, remain open questions to this day. The general thinking currently, in fact, is that Clovis developed south of the ice sheets, in eastern North America, or on the Great Plains, or possibly in or near the ice-free corridor itself, since it does not appear to have originated in Asia or Alaska (Anderson et al. 2010a; Goebel 2015; Ives et al. 2013:162–163; Potter et al. 2013; Smith et al. 2013; Waters and Stafford 2013; Waters et al. 2011a, 2011b), although this latter inference may itself someday be proven incorrect. Given the current state of knowledge, the best we can say is that we really don't know when or where Clovis began, and that determining its origin will be difficult exercise (Prasciunas and Surovell 2015). Research into Clovis origins will doubtless occupy appreciable research attention in the years to come, as attention turns to understanding its likely progenitors among Early Paleoindian occupations in the Americas.

While colonization by peoples moving along the Pacific coast both on foot and by means of watercraft was also proposed in the 1960s (as reviewed in Fladmark 1979:58), it was arguably not given serious consideration until after Fladmark's landmark 1979 paper (Davis 2011; Erlandson 2013; Mackie et al. 2013). Indeed, use of watercraft as an aid to colonization of the interior of the Americas along river systems and lakes away from the coast has also received minimal consideration until quite recently (e.g., Engelbrecht and Seyfert 1994; Jodry 2005). While research on early sites along the Pacific Rim has, in fact, been underway for many decades, the Monte Verde discovery helped force serious consideration of the possibility that they might represent assemblages by people moving down the coast, and not reaching the coast from earlier settlements in the interior (Dillehay 2000; Dixon 1999; Meltzer 2009). In the decades since Monte Verde was fully reported in the early and mid-1990s, more Pleistocene sites have been found in both coastal and interior areas of southern South America, indicating people had reached this area fairly early, making coastal movement increasingly possible (Miotti et al. 2012; Steele and Politis 2009; Surovell 2003). As we shall see, the same situation is evident in western North America, where increasing debate centers on the origins and dating of early assemblages in coastal and near-coastal areas, and their relationship to Clovis culture (e.g., Beck and Jones 1997, 2010, 2012; Dixon 1999; Erlandson et al. 2007, 2008, 2011; Fiedel and Morrow 2012; Graf 2007; Mackie et al. 2013).

Similar questions are also being asked about the ice-free corridor entry model itself, notably when and in which direction movement through it occurred in the Late Pleistocene (Ives et al. 2013; Mandryk et al. 2001). For many years, as noted previously, the corridor was thought to have been open by or slightly before the time of the apparent Clovis radiation across North America, supporting a colonization scenario in which it was the primary entry route early populations took when moving south from Beringia. Indeed, human populations predating Clovis by several centuries have been securely documented in central Alaska in recent decades, at sites like Broken Mammoth and Swan Point in the Tanana River Valley, near the northern end of where the corridor would have been when it opened (Bever 2001; Hamilton and Goebel 1999; Holmes 1996, 2001; Holmes et al. 1996; Goebel et al. 2008; Potter et al. 2013; Yesner 2001). If the corridor was traversable when these sites were occupied, it could have been used by these same peoples to reach areas south of the ice sheets, something speculated about for decades (e.g., Rainey 1940:305–308). In recent decades, however, the viability of the corridor as a movement pathway prior to and even during Clovis times was challenged, and it was argued to have been all but impassible until well after areas to the south had been settled (Mandryk et al. 2001). This perspective has changed again in recent years as a result of extensive multidisciplinary paleoenvironmental, geomorphological, and archaeological research in western Canada, it now appears the corridor was passable, with biota exploitable by humans, by at least 13,500 cal year BP and perhaps several hundred to a thousand or more years earlier (Ives et al. 2013:149–152, 162). This is well prior to or at the latest during the early part of the Middle Paleoindian period, when Clovis culture appeared across much of North America. When people were first present in central Alaska, however, and when they could have moved south into the Americas in the Late Pleistocene remain important questions.

Much earlier settlement of the Americas, during or prior to the Last Glacial Maximum (LGM) ca. 19,000–22,000 year cal BP, has also been inferred by some investigators (e.g., see reviews in Stanford

and Bradley 2012; Stanford and Stenger 2014; Stanford et al. 2005). The Atlantic Ice or Ice Edge model, for example, has human populations reaching the Middle Atlantic seaboard about the time of the LGM or soon before or after, arriving by watercraft following the pack ice across the north Atlantic from Western Europe. As noted, this hypothesis is currently highly controversial, but there are archaeological assemblages in the Middle Atlantic arguably dating to this general time frame warranting explanation, which ongoing fieldwork should eventually provide (e.g., Lowery et al. 2010; Wah et al. 2014). If these early occupations are confirmed, the people creating them could, of course, have arrived from other sources than Western Europe. Human groups could have been moving down the Pacific Rim or through central Canada prior to the maximum extent and coalescence of the Laurentide and Cordilleran ice sheets, which is currently assumed to have been ca. 19,000 to 22,000 cal year BP, at the height of the LGM (Ives et al. 2013:150–152). At present archaeological evidence in support of LGM or pre-LGM occupations in the Americas is decidedly ambiguous, but should they be conclusively demonstrated, considerable revision of our colonization models will be required. The influence of climate and physiography on post-LGM movement patterns and settlement, the focus of much current research, however, will still be critically important (e.g., Anderson and Gillam 2000; Dunbar 2006; Holliday and Miller 2013; Meltzer 2009; Pitblado 2011). How changes in sea level influenced the early human occupation in the southeastern USA, in fact, offers lessons for understanding the occupation of coastal regions in all parts of the world, and how the colonization of these areas may have proceeded.

### 6.3 The Effect of Sea Level Change on Early Movement and Settlement

During the Late Pleistocene sea levels were changing markedly, as the massive continental ice sheets melted, adding vast quantities of water to the ocean. Sea level reconstructions spanning the period have been developed in many parts of the globe, and have shown that these fluctuations were not uniform or unidirectional, or even the same within specific regions, due to the confounding effects of warming and cooling episodes, isostatic rebound, and subsidence (e.g., Lambeck et al. 2002; Murray-Wallace and Woodroffe 2014). Nonetheless, the broad overall trend, a major rise in sea level of ca. 120 m since the LGM to the present, and nearly 100 m from the LGM to the early Holocene epoch, has long been recognized as an important factor shaping human movement and settlement, and is the subject of increasing research attention (e.g., Bicho et al. 2011; Gamble 1993; Holliday and Miller 2013). The initial human colonization of the New World, for example, is thought by many scholars to have been by early populations traversing Beringia on foot overland or by watercraft along its southern margin. But where were these interior or coastal landscapes, and how were they affected by sea level change? Vast land areas were submerged in many parts of the world as sea levels rose, forcing a response by any human populations present. Where fine grained sea level reconstructions exist, it is possible to document the physiographic changes that occurred with a high degree of spatial and temporal precision, information useful to exploring corresponding changes in physiography and biota, including human populations.

The southeastern USA is an ideal area to investigate these relationships. High resolution locally developed sea level reconstructions exist; the region was apparently minimally effected by isostatic rebound and possibly subsidence save for near the Mississippi River delta; portions of the continental shelf have been mapped at high resolution; and extensive archaeological investigations have occurred documenting Pleistocene settlement, both in the interior and, in recent years, increasingly on the now-submerged continental shelf. A fine grained reconstruction of past sea level has been developed in the northern Gulf of Mexico spanning the Late Pleistocene from ca. 20,000 to 10,000 cal year BP, and is used here to determine the extent to which shorelines were changing throughout the region, standardized to annual and decadal resolution (Balsillie and Donoghue 2004:Appendix II, 2009) (Table 6.1).



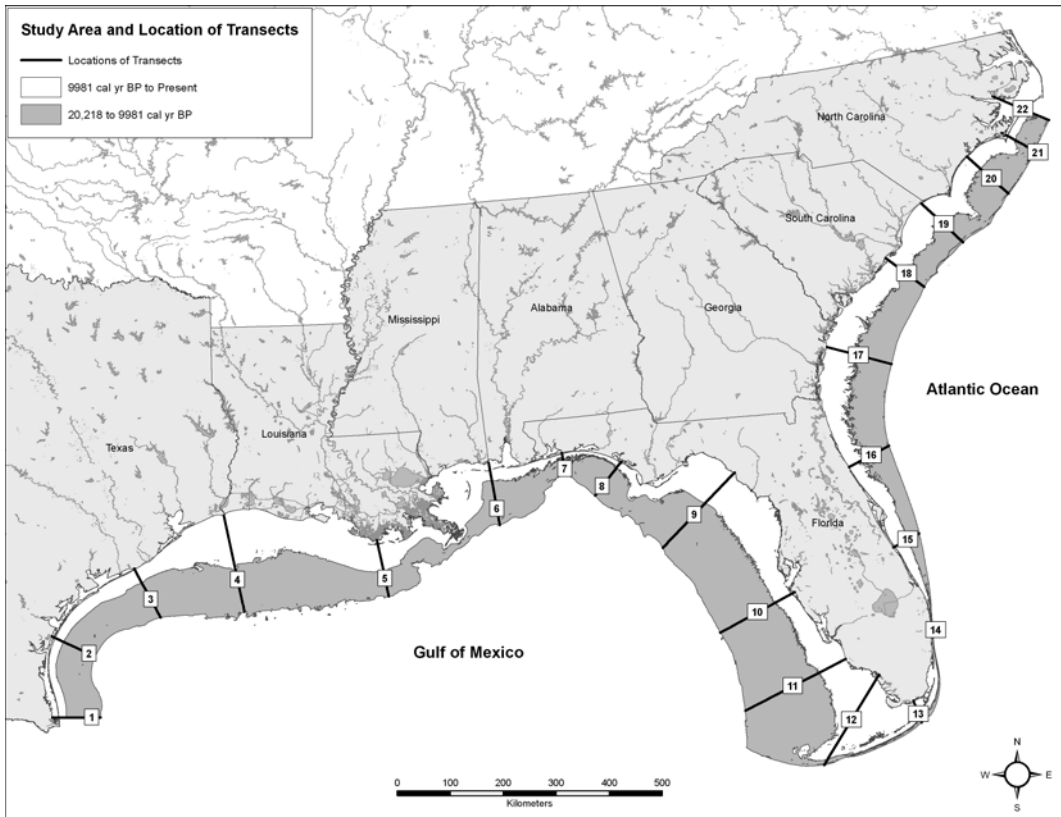
**Table 6.1** Southeastern continental shelf sea level fluctuations: absolute distance lost/gained by transect by period, and averaged over the Gulf, South Atlantic, and the total sample

	Last glacial maximum					MWP-1A			Clovis culture					Younger Dryas			MWP-1B			Holocene		Totals
Period start date (year cal BP)	20,218	19,139	18,053	16,992	15,174	14,308	14,044	13,928	13,499	13,276	13,013	12,933	12,525	12,044	11,502	11,016	10,509		9,981			
Period end date (year cal BP)	19,139	18,053	16,992	15,174	14,308	14,044	13,928	13,499	13,276	13,013	12,933	12,525	12,044	11,502	11,016	10,509	9,981		present			
Depth start (mAMSL)	-121.00	-115.34	-112.75	-101.07	-98.40	-92.17	-79.99	-73.00	-71.91	-69.12	-65.01	-67.58	-48.82	-40.42	-39.53	-42.91	-31.22	-25.00				
Depth end (mAMSL)	-115.34	-112.75	-101.07	-98.40	-92.17	-79.99	-73.00	-71.91	-69.12	-65.01	-67.58	-48.82	-40.42	-39.53	-42.91	-31.22	-25.00	0.00				
Duration (years)	1,079	1,086	1,061	1,818	866	264	116	429	223	263	80	408	481	542	486	507	528	9,981	20,218			
Sea level change (m)	-5.66	-2.59	-11.68	-2.67	-6.23	-12.18	-6.99	-1.09	-2.79	-4.11	2.57	-18.76	-8.40	-0.89	3.38	-11.69	-6.22	-25.00	-121			
Area gained/ lost (km²)	-6,361	-3,021	-14,186	-3,884	-10,392	-24,720	-17,545	-2,770	-8,901	-14,774	9,204	-79,984	-47,076	-6,730	23,012	-88,649	-56,141	-227,822	-580,740			
Shoreline movement by transect (m)																						
Transect 1 (Western Gulf)	330.50	170.00	1,056.84	404.48	999.95	2,004.94	2,935.16	348.89	1,046.28	2,251.52	1,486.83	20,354.80	16,819.20	905.38	7,724.96	17,899.50	6,295.38	26,111.90	109,146.50			
Transect 2 (Western Gulf)	1,387.39	672.52	3,952.93	1,031.62	3,635.20	6,791.64	4,570.22	621.66	1,633.28	2,625.00	1,610.45	13,604.50	6,902.85	842.99	3,138.48	12,381.20	9,680.20	22,130.70	97,212.83			
Transect 3 (Western Gulf)	897.54	475.17	2,201.27	607.74	1,643.46	5,349.66	2,146.74	281.07	815.11	1,680.48	1,162.42	17,250.60	10,853.60	2,037.24	4,425.71	17,094.30	16,771.50	30,224.80	115,918.40			
Transect 4 (Western Gulf)	1,023.69	411.99	2,540.79	483.14	1,062.13	8,691.77	3,827.92	589.82	1,829.91	3,437.81	2,529.44	31,183.40	7,571.61	598.33	2,207.17	19,292.40	4,392.39	104,070.00	195,743.70			
Transect 5 (Western Gulf)	1,318.84	629.68	3,186.31	717.10	1,578.81	3,286.05	2,233.47	272.55	1,402.46	1,855.22	1,105.19	10,230.40	8,718.05	2,230.95	4,655.37	12,277.50	3,147.85	60,295.20	119,140.99			
Transect 6 (Western Gulf)	169.03	88.87	506.74	146.11	2,422.37	3,902.48	1,285.11	205.75	720.95	1,717.35	1,150.93	19,596.40	13,686.30	2,312.14	9,965.43	44,054.20	5,445.53	34,629.70	142,005.40			
Transect 7 (Eastern Gulf)	2,135.89	742.29	3,520.31	709.83	1,640.47	3,002.10	143.18	0.00	88.56	88.56	88.56	1,143.15	1,124.94	257.88	653.02	3,877.39	7,297.99	16,008.30	42,522.41			
Transect 8 (Eastern Gulf)	2,809.69	144.81	387.90	62.54	185.75	526.11	747.86	388.86	1,269.95	1,607.80	686.84	10,493.80	19,427.10	3,252.38	9,966.68	26,425.40	8,263.10	15,487.90	102,134.46			
Transect 9 (Eastern Gulf)	1,683.78	990.69	3,695.42	676.29	1,023.71	2,097.86	1,036.47	177.04	516.83	1,300.88	946.24	29,028.70	13,131.20	5,925.28	7,857.44	28,602.80	34,905.70	80,453.10	214,049.43			
Transect 10 (Eastern Gulf)	2,215.08	272.00	2,449.11	1,432.70	3,560.77	12,202.50	6,019.62	376.36	1,316.24	5,420.97	4,197.01	37,319.20	19,097.10	1,516.44	7,917.17	26,735.30	11,301.90	41,040.30	184,389.77			
Transect 11 (Eastern Gulf)	3,535.73	1,686.71	6,427.78	1,302.04	2,846.04	7,683.70	9,909.62	1,217.52	6,467.91	7,811.30	3,620.81	48,367.00	18,125.10	1,860.63	6,814.80	32,966.70	16,126.00	57,638.10	234,407.49			
Transect 12 (Eastern Gulf)	335.82	379.55	671.39	136.06	391.63	815.18	492.86	0.00	212.76	250.96	122.92	7,101.00	1,022.52	170.37	555.50	1,196.67	484.65	181,277.00	195,616.82			

Transect 13 (Lower SE Atlantic)	531.30	118.34	1,328.29	258.06	732.41	1,543.70	812.69	231.16	537.28	319.82	174.72	1,257.38	556.57	0.00	222.00	556.56	213.19	34,820.20	44,213.68
Transect 14 (Lower SE Atlantic)	173.56	122.49	318.69	0.00	94.54	182.56	105.67	0.00	81.97	81.97	81.97	382.95	169.88	0.00	81.97	265.08	325.75	1,345.47	3,814.52
Transect 15 (Lower SE Atlantic)	410.99	335.41	744.59	167.03	550.73	1,637.15	2,021.21	168.39	375.58	512.28	333.35	3,290.93	7,084.91	353.43	4,653.43	8,367.31	3,992.04	30,707.10	65,705.85
Transect 16 (Lower SE Atlantic)	251.05	81.97	668.70	205.81	410.76	650.26	360.35	28.09	238.69	2,146.00	1,926.84	6,046.81	6,857.24	478.10	1,390.53	13,035.50	9,187.86	48,553.20	92,517.76
Transect 17 (Lower SE Atlantic)	251.56	171.79	533.73	116.83	291.93	627.22	349.39	34.77	118.51	234.61	158.92	2,486.63	26,281.80	3,628.77	8,033.95	32,020.30	18,061.70	49,352.80	142,755.22
Transect 18 (Upper SE Atlantic)	713.97	129.81	1,439.48	244.31	748.29	2,052.36	1,034.18	201.55	448.82	1,036.71	821.15	3,015.56	5,352.76	856.87	1,914.02	24,536.10	7,030.78	44,898.50	96,475.22
Transect 19 (Upper SE Atlantic)	854.92	457.25	1,318.17	210.62	331.10	576.21	312.01	49.83	153.85	210.30	104.68	2,249.29	2,017.66	1,920.72	2,534.62	25,679.20	20,907.30	53,345.60	113,233.33
Transect 20 (Upper SE Atlantic)	247.69	73.37	469.41	87.86	243.92	413.29	279.32	90.85	196.85	401.75	256.11	3,353.52	14,882.50	750.37	11,783.40	42,967.90	18,210.70	34,125.40	128,834.22
Transect 21 (Upper SE Atlantic)	272.94	131.54	705.87	216.86	506.80	1,341.86	448.91	76.76	216.91	599.63	399.27	4,262.18	5,774.94	443.80	3,873.99	9,482.48	8,693.34	80,025.10	117,473.17
Transect 22 (Upper SE Atlantic)	139.69	130.06	448.16	94.66	401.68	1,678.78	343.57	44.34	148.90	931.64	883.35	8,265.02	8,742.69	1,368.98	5,972.52	20,484.70	5,995.65	21,685.40	77,759.79
<i>Gulf of Mexico</i>																			
Average movement (m)	1,486.91	555.36	2,549.73	642.47	1,749.19	4,696.17	2,945.69	373.29	1,443.35	2,503.99	1,558.97	20,472.75	11,373.30	1,825.83	5,490.14	20,233.61	10,342.68	55,780.58	146,024.02
Average movement per year (m)	1.38	0.51	2.40	0.35	2.02	17.79	25.39	0.87	6.47	9.52	19.49	50.18	23.65	3.37	11.30	39.91	19.59	5.59	7.22
Average movement per decade (m)	13.78	5.11	24.03	3.53	20.20	177.89	253.94	8.70	64.72	95.21	194.87	501.78	236.45	33.69	112.97	399.09	195.88	55.89	72.22
<i>South Atlantic coast</i>																			
Average movement (m)	384.77	175.20	797.51	160.20	431.22	1,070.34	606.73	92.57	251.74	647.47	514.04	3,461.03	7,772.10	980.10	4,046.04	17,739.51	9,261.83	39,885.88	88,278.28
Average movement per year (m)	0.36	0.16	0.75	0.09	0.50	4.05	5.23	0.22	1.13	2.46	6.43	8.48	16.16	1.81	8.33	34.99	17.54	4.00	4.37
Average movement per decade (m)	3.57	1.61	7.52	0.88	4.98	40.54	52.30	2.16	11.29	24.62	64.25	84.83	161.58	18.08	83.25	349.89	175.41	39.96	43.66
<i>Total sample</i>																			
Average movement (m)	985.94	382.56	1,753.27	423.26	1,150.11	3,048.06	1,882.52	245.69	901.71	1,660.12	1,084.00	12,740.15	9,736.39	1,441.41	4,833.73	19,099.93	9,851.39	48,555.72	119,775.95
Average movement per year (m)	0.91	0.35	1.65	0.23	1.33	11.55	16.23	0.57	4.04	6.31	13.55	31.23	20.24	2.66	9.95	37.67	18.66	4.86	5.92
Average movement per decade (m)	9.14	3.52	16.52	2.33	13.28	115.46	162.29	5.73	40.44	63.12	135.50	312.26	202.42	26.59	99.46	376.72	186.58	48.65	59.24

A previous study examined sea level change in terms of the amount of area lost or gained (i.e., submerged or exposed) on the continental shelf over the entire region from 20,000 to 10,000 cal year BP (Anderson et al. 2013). Here, instead of using summary measures of area lost or gained, the extent of shoreline change in meters per year and meters per decade has been determined at many specific locations throughout the region.

The study area encompasses the southeastern Gulf and Atlantic seabords from southern Texas to the North Carolina–Virginia border, essentially the lower Southeast. Because the continental shelf varies appreciably in slope and width, shoreline changes over time were documented using a series of 22 transects running from the modern shoreline to the edge of the continental shelf (Fig. 6.2). The sea level reconstruction employed here is similar to one employed on the South Atlantic seaboard in the vicinity of South Carolina (Harris et al. 2013), and in broad outline corresponds to reconstructions developed from other parts of the world (e.g., Bard et al. 1990, 2010; Gregoire et al. 2012; Siddall et al. 2003). Specific calendar years in the analyses results reported herein refer to sample point estimated ages in the sea level reconstruction in Balsillie and Donoghue (2004:Appendix II). As sea level reconstructions become more refined and more localized, these analyses will need to be revisited; the effects of isostatic rebound, for example, while not thought to be pronounced in the study region, are much more so further to the north, in upper Middle Atlantic and the northeast, which is why these areas were excluded from the present analysis (e.g., Horton 2006; Lowery et al. 2012). The effects of subsidence in the Gulf of Mexico, while pronounced at present, are not well understood in the Late Pleistocene (Yu et al. 2012).



**Fig. 6.2** Location of the 22 transects examined in the present study on the Gulf and Atlantic continental shelf. The transects were chosen to provide for fairly even spacing over the region, while at the same time encompassing the topographic variability present on the continental shelf

### 6.3.1 *Specific Analytical Methods*

Elevation and shoreline data used in this chapter were extracted from the high resolution 3-arc sec U.S. Coastal Relief Model (CRM), comprising digital elevation models made available for use by the National Oceanic and Atmospheric Administration's National Geophysical Data Center (NOAA NGDC 2014). The CRM was assembled from multiple offshore bathymetric and terrestrial elevation data sources (Eakins and Taylor 2010:42–54) to produce a seamless representation of the coastal zones of the contiguous US, including the Pacific, Gulf, and Atlantic coasts, as well as Hawaii and Puerto Rico. At 3 arc sec, each grid cell in the CRM represents approximately 90 m<sup>2</sup>. The vertical datum of the CRM is “sea level” (NOAA NDGC 2014). The CRM consists of ten separate raster datasets, of which four were used for this analysis, representing the Gulf and South Atlantic coasts. Each of the four was downloaded from the NGDC in the ARC ASCII file format and converted separately to raster datasets using ESRI ArcGIS 10 then mosaicked into a single raster spanning the study area. Because the horizontal datum of the CRM as provided is NAD 83 geographic, the calculations of area and linear distance required reprojection of the combined raster to the North American Lambert Conformal Conic projected coordinate system.

To model past shorelines, a series of 18 specific dates were selected to create 17 temporal intervals, with the corresponding isobaths defined using past sea level elevation data values from Balsillie and Donoghue (2004, 2009) (Table 6.1). The 18 dates and 17 intervals span the period from ca. 20,218 to 9,981 cal year BP, and from –121 to –25 mAMSL. The extent of shoreline movement over much of the Holocene, from 9,981 cal year BP to the present, forms a final interval in Table 6.1; the methods and observations reported here should prove useful to finer-grained analyses of sea level change over the middle and later Holocene after 9,981 cal year BP, in relation to human use of the coastal margin, which is much better documented archaeologically in recent millennia than during the Late Pleistocene. As noted, specific calendar years in the analyses reported herein refer to sample point estimated ages in the Balsillie and Donoghue (2004:Appendix II) reconstruction, chosen for their association with significant cultural or climatic events, such as the onset and ending of major chronozones like the Bølling-Allerød and Younger Dryas, meltwater pulses, or recognizable cultural traditions like Clovis. The combined raster was reclassified in order to group all land area encompassed by each interval within a single classification value. For example, areas on the continental shelf situated between the –92.2 and –80 mAMSL isobaths were inundated between approximately 14,300 and 14,000 cal year BP, and were grouped as one interval. Because sea level change during the last 20,000 cal year BP was not uniformly defined by rising seas, but occasionally punctuated by falls as well, each interval was produced separately to ensure that overlap with earlier (or later) periods of rise or fall was not included in determinations of land area or shoreline distance lost or gained during each respective interval. Reclassified rasters were converted to polygon shapefiles and filtered to the appropriate classification value to represent only the intervals of interest. The separate, filtered shapefiles were combined into a single file and “Dissolve” was used to combine polygons of the same classification value into a single unit. Area in square kilometers as by polygons associated with each interval was determined using the “Calculate Geometry” tool in ArcGIS®.

The amount of land on the continental shelf/coastal plain lost or gained during each successive interval in square kilometers was extensive, as documented in an earlier analysis (Anderson et al. 2013:190), but such summary values are difficult to translate to figures that would be perceptible at the scale of a human lifetime. For that reason, additional calculations were undertaken herein to determine the average linear distance of shoreline lost or gained in meters every 10 years during each of the 17 separate temporal intervals. These shoreline values were obtained from 22 polyline transects within the study area: 12 along the Gulf Coast from Texas to the southwestern end of the Florida peninsula, and ten along the Atlantic coast from the tip of southern Florida east to North Carolina. Shoreline fluctuations averaged on a decadal scale, unless minor, it is argued, would have been directly observable to

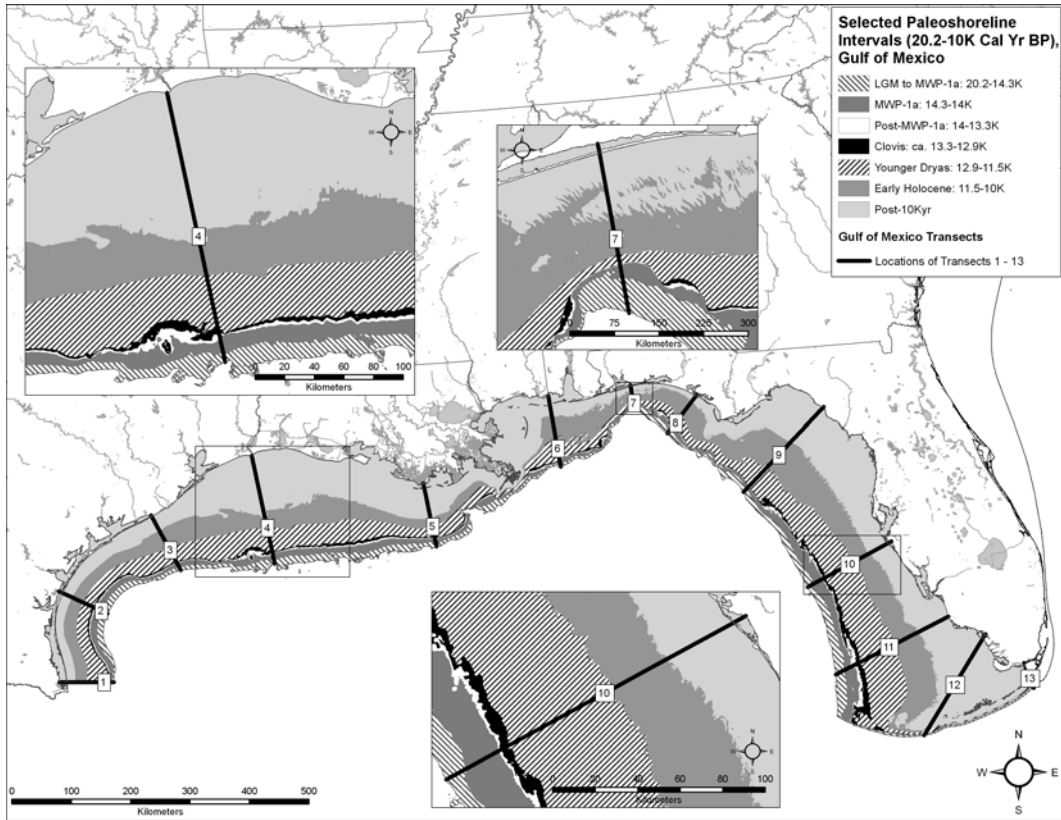
people occupying or periodically visiting coastal zones; dividing these values by ten, furthermore, gives such changes averaged on an annual scale, which themselves were likely perceptible during periods when shorelines were changing rapidly. Such data can be used to infer when coastal areas might have been more or less stable, and hence viable for human settlement and use. In the current analysis, shorelines moving more than an average of ca. 30 m per decade were considered to be unstable, while those moving less than that were considered to be stable. Inspection of the data shows that shoreline movement per decade was decidedly bimodal, typically either below or if above, well above this value of 30 m per decade, for most of the periods and areas examined (Table 6.1). Of course, how shoreline movement translates into environments that would have been considered favorable or unfavorable to human populations of the times in question, if any were present, remains unknown.

The locations of these transects, illustrated in Fig. 6.2, were chosen at 200–300 km intervals, to provide fairly regular spacing and representative coverage, while at the same time including topographically unusual portions of the southeastern continental shelf, such as the steep and narrow portion in southeastern Florida, or the extremely flat and wide shelves on the western side of Florida or south of the Louisiana–Texas line. The transects were positioned to crosscut the average orientation of modern and past shorelines at approximate right angles. At each respective location, transects were extended between the modern shoreline and the 20,200 year cal year BP isobath (–121 mAMSL). Because barrier islands or other modern coastal features are present in some regions, defining significant embayments, the “modern shoreline” was defined at 0 mAMSL on the coastal “mainland.” Using the “Split” function in ArcGIS®, transect polylines were divided into segments corresponding to each of the 17 temporal intervals. Total transect length, and segment lengths, were determined in meters using the “Calculate Geometry” tool.

### 6.3.2 *Results of the Analysis*

The analysis documented major differences in the way sea level changes played out over the continental shelf of the southeastern USA, and the importance of examining changes in specific areas. The 12 transects located in the Gulf of Mexico, for example, ranged from 42.52 to 234.41 km in extent, with an average length of 146.02 km, reflecting the appreciable variability in the width and slope of the continental shelf, and in the amount of shoreline lost during each period from transect to transect (Table 6.1, Figs. 6.3 and 6.4). During the LGM, for example, in the first interval examined in this analysis from 20,218 to 19,139 cal year BP, the distance the shoreline moved over the 1,079 year period ranged from 330.50 m in Transect 1 in the western Gulf to 3,535.73 m in Transect 11 in the eastern Gulf. These extremes bear little relation to the average for the Gulf of Mexico as a whole for this period (1,486.9 m) or the average over the entire 22 transect southeastern sample (985.94 m).

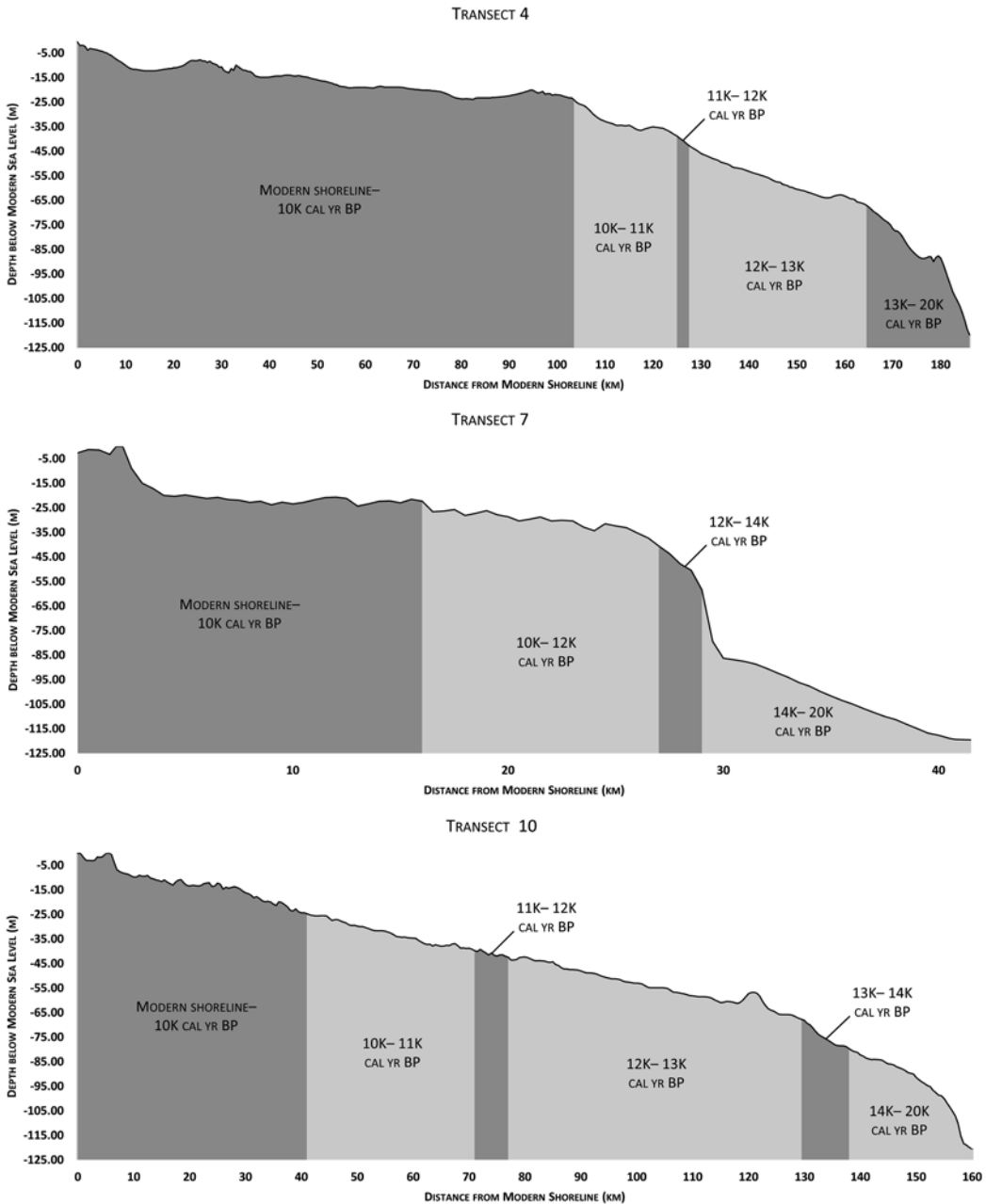
The ten transects on the South Atlantic continental shelf were appreciably shorter than those in the Gulf of Mexico, averaging 88.3 km in length, with a range of from 3.81 to 128.83 km (Table 6.1, Figs. 6.5 and 6.6). Sea level change thus resulted in much greater shoreline movement over almost every transect and period on the Gulf as opposed to on the South Atlantic Coastal Plains (Fig. 6.7). This would suggest that, on the whole, the Gulf shoreline may have been a more unstable area to live than the South Atlantic shoreline during the Late Pleistocene. The comparatively minimal evidence for Paleoindian settlement in the modern Gulf Coastal Plain, when compared with the much larger numbers of sites and isolated finds from the South Atlantic region, may be related to shoreline conditions (Fig. 6.1). It should be noted however, that other factors may be influencing these distributions, such as the extent of historic settlement, agricultural land clearing, numbers of collectors and their collecting bias, amount of previous archaeological research, and so on (e.g., Anderson and Sassaman 2012:48–49; Anderson et al. 2015; Buchanan 2003; Prasciunas 2011; Shott 2002, 2005). In spite of these possible sources of bias, the distributional data between the two areas are strikingly different,



**Fig. 6.3** Transect locations in the Gulf of Mexico, with close-ups of Transects 4, 7, and 10

and likely represent real differences in Late Pleistocene prehistoric settlement on the Gulf and Atlantic Coastal Plains during the Middle Paleoindian period.

Another major observation evident from the analyses concerns shoreline change over time. Quite simply, during some periods shorelines are moving much more than during other periods. While typically shoreline movement involved sea level rise and the submergence of existing coastal terrain, on occasion reversals occurred, and new landscapes were exposed. Over the entire period under examination, shorelines were moving most dramatically, not surprisingly, during Meltwater Pulse-1A (MWP-1A) early in the Bølling-Allerød, between ca. 14,308 and 13,928 cal year BP; during the initial part of the Younger Dryas between 12,933 and 12,044 cal year BP; and during MWP-1B during the early Holocene between 11,016 and 9,981 cal year BP (Fig. 6.7). There were also periods of relative shoreline stability, for example, during the LGM and after, the period from ca. 20,218 to 14,308 cal year BP; during the period prior to and in the early part of the widespread occurrence of Clovis from 13,928 to 13,013 cal year BP; and during the end of the Younger Dryas from 12,044 to 11,502 cal year BP. The later part of the Clovis period, from ca. 13,013 to 12,933 cal year BP, was a time when shorelines began to change much more rapidly than they had in roughly 650 years, and the initial centuries of the Younger Dryas witnessed the greatest change of the entire 10 k study period along the Gulf of Mexico, with shorelines moving 501.78 m *per decade* from 12,933 to 12,525 cal year BP, compared to 84.83 m per decade over the same interval on the South Atlantic coast, which was still the most change witnessed to that time in that area. The greatest periods of shoreline change on the South Atlantic coast, however, occurred later in the Younger Dryas, averaging 161.58 m per decade from

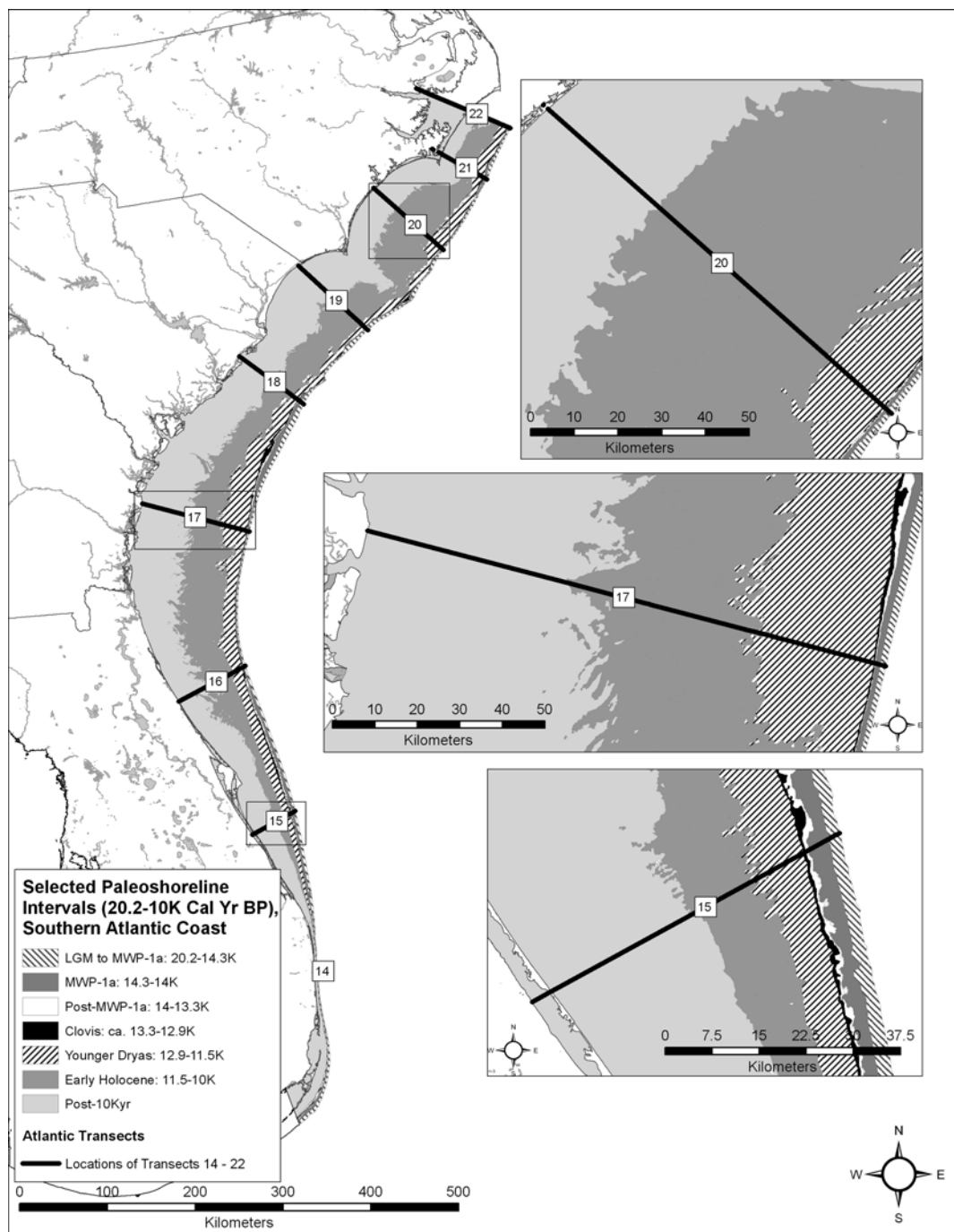


**Fig. 6.4** Gulf Coast Transects 4, 7, and 10. Profiles produced from elevation values derived from Coastal Relief Model sampled along polyline transects at 0.5-km intervals. Note differing horizontal scale for each transect reflecting differences in continental shelf width

12,525 to 12,044 cal year BP, and during the early Holocene, averaging 349.89 m per decade from 11,016 to 10,509 cal year BP and 175.41 m per decade from 10,509 to 9,981 cal year BP.

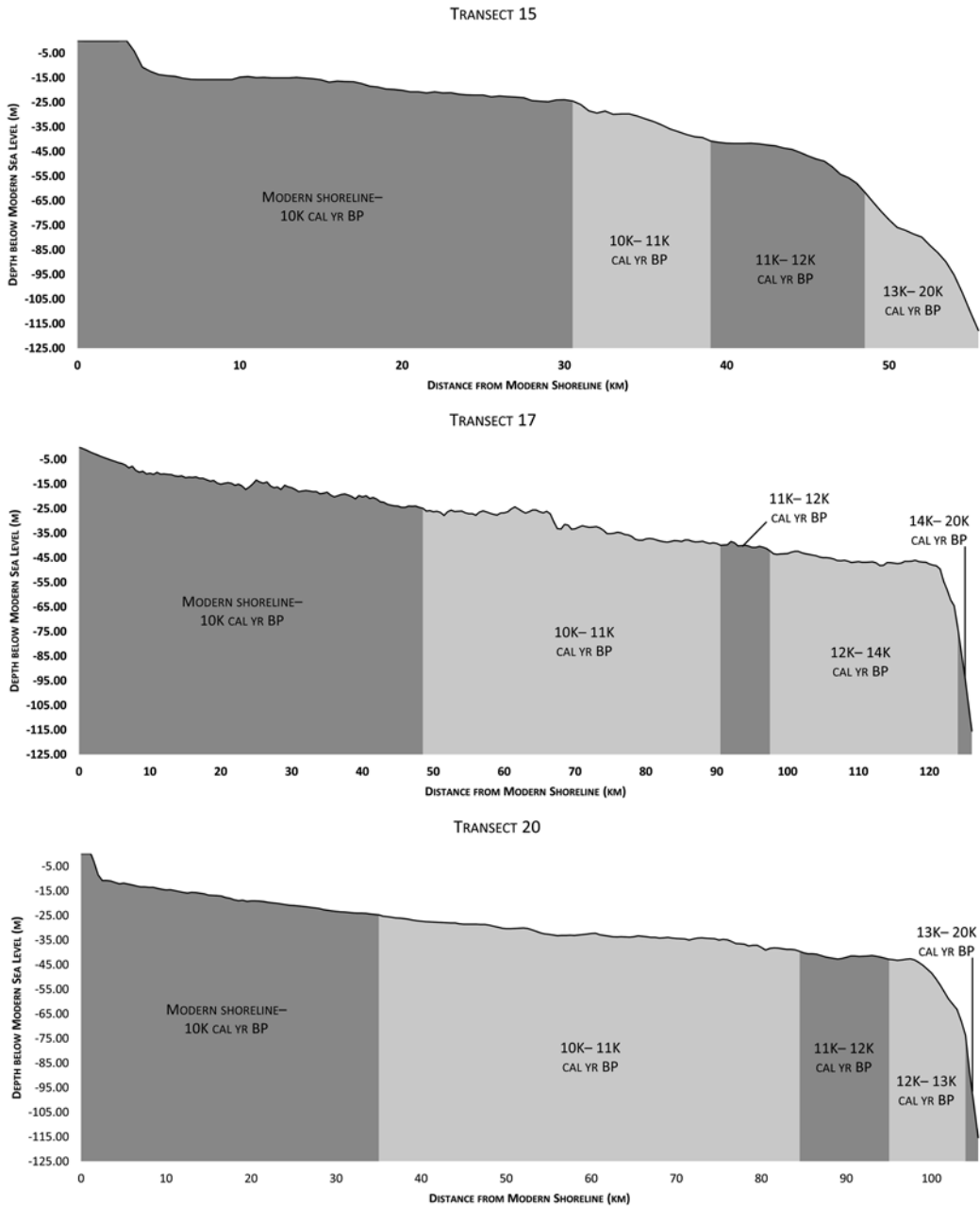
These differences at the subregional scale are apparent in greater detail when individual transect data are examined by period, highlighting the fact that some areas were much more significantly





**Fig. 6.5** Transect locations on the South Atlantic Coast, with close-ups of Transects 15, 17, and 20

affected by sea level rise than others, and that great variability can be expected in shoreline movement in different parts of the region given the same change in sea level. During MWP-1B, for example, from 11,016 to 10,509 cal year BP, on the Gulf continental margin shorelines moved inland 44.05 km in the vicinity of Transect 6 yet only 1.2 km in the vicinity of Transect 12. Over the same period on



**Fig. 6.6** Atlantic Coast Transects 15, 17, and 20. Profiles produced from elevation values derived from Coastal Relief Model sampled along polyline transects at 0.5-km intervals. Differing horizontal scales for each transect reflecting differences in continental shelf width

the South Atlantic coast, shoreline movement ranged from 43.0 km in the vicinity of Transect 20 in south-central North Carolina to less than a km on the southeastern coast of Florida, in the vicinity of Transects 13 and 14. Some coastal areas, accordingly, were more stable than others, and might have been more preferred areas for settlement. Sea level change in the Southeast did not proceed in a



**Fig. 6.7** Shoreline movement in m per decade lost or gained on the Gulf and South Atlantic coasts during the specified intervals from 20,218 cal year BP to the present based on the data in Table 6.1

uniform manner, because the topography of the continental shelf is more varied than we may have perhaps traditionally assumed; just because many maps give it the appearance of a flat surface doesn't mean it was when it was dry land.

Studies examining the effects of sea level change over time over comparatively small areas are also needed. A recent examination of changes in Paleoindian settlement over time in the Georgia area, encompassing the divide between the Atlantic and Gulf regions, documented relocation away from the Coastal Plain during the latter part of the Younger Dryas, when Dalton points were in use, that the authors thought might be due, in part, to the instability in the coastal zone (Smallwood et al. 2015). Over the region as a whole a drop in the numbers of sites and diagnostic artifacts is evident in the early centuries of the Younger Dryas (Anderson et al. 2010a:77–78, 2011; Driskell et al. 2012:262–263; Goodyear 2006, 2010; Meeks and Anderson 2012; Smallwood et al. 2015). These changes are more pronounced in the Coastal Plain and much less pronounced further into the interior of the region, in the Midsouth in the vicinity of Tennessee (Miller and Gingerich 2013a, b; Broster et al. 2013:306–307), suggesting they may be due to changes in coastal settings, such as the pronounced patterns of shore-line movement observed here.

In the Southeast, multibeam echosounder bathymetric surveys are being used to great effect to document terrain variability on the continental shelf, to the point where individual scarps and prominences are being identified as possible areas of settlement, such as Bulls Scarp off Charleston, South Carolina (Harris et al. 2013). Indeed, the data developed by Harris's team is at a much higher resolution than that from the US Coastal Relief Model employed herein, showing the kinds of analyses possible once such data are developed and made widely available. The analyses here, like Harris's designation of scarps as possible overlooks by early peoples, may suggest areas where early peoples might, or might not, have occupied, depending on how rapidly shorelines were changing. Indeed, areas where shorelines were changing rapidly may have been less conducive to settlement, and perhaps should receive less intensive examination than more stable areas. Of course, the relationship between rate of shoreline change and human settlement and use of the coastal margin will need careful examination before such conclusions can be justified.

## 6.4 Sea Level Change and the Colonization of the Americas

The role of coastlines in the colonization of new lands appears fairly well established: everyone now assumes people moved along them. Coastal areas are thought to have offered bountiful resources where human populations could thrive, a megapatch of choice allowing people adapted to such settings to quickly move along them without being regularly forced to evaluate new resources (Beaton 1991; Bicho et al. 2011; Erlandson 2002, 2007, 2008). Coastal margins, like other resource-rich regions in the Americas, such as the major river systems of the midcontinent, or areas near pluvial or periglacial lakes or marine environments, could have served as staging areas, places where people stayed or settled for longer periods of time, and likely formed the core of permanent occupations in these regions (Anderson 1990; Dincauze 1993; Smallwood 2012). However, as we have seen, not all coastal margins were alike, and rather than being uniform and unchanging, these settings were highly variable and at times likely unstable or unfavorable for human occupation, depending on conditions effecting sea level and shoreline movement, which in turn may have affected water temperature and currents. The resilience of near-shore marine and coastal terrestrial environments in relation to sea level change is a topic that warrants extensive exploration.

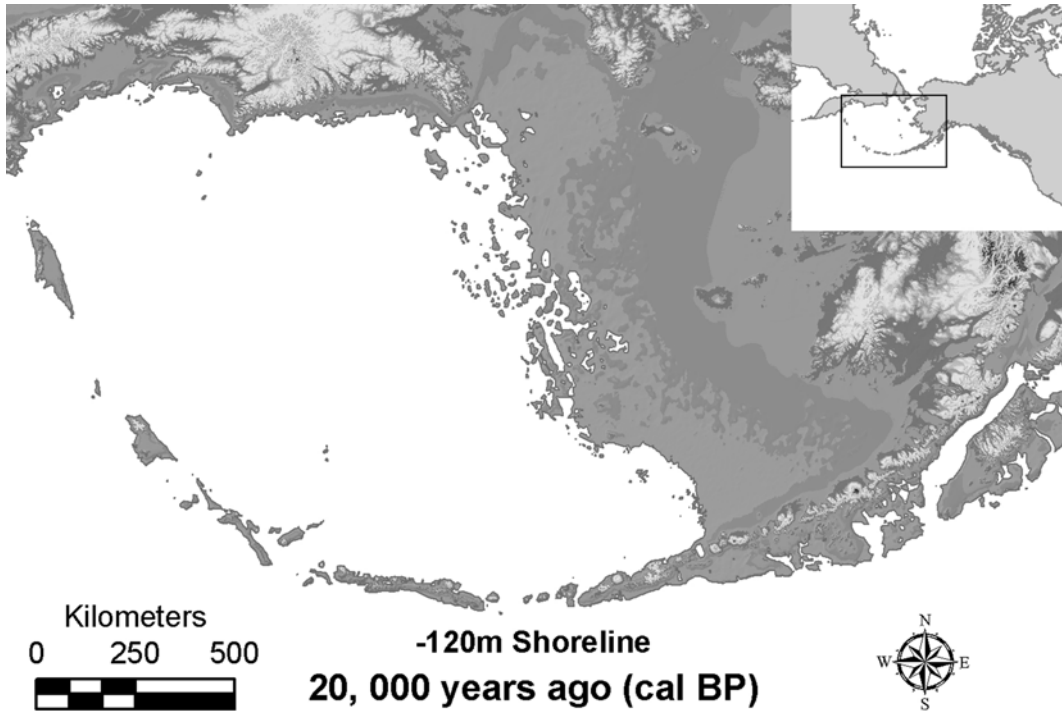
For low density populations exploring new lands, areas exhibiting the greatest stability over time would have been essential to the maintenance of kinship, mating, ceremonial, and information exchange networks. Their very permanency would have meant they could be returned to again and again, over multiple generations, providing areas where other people could be found (e.g., Anderson 1990, 1995, 2013; Meltzer 2003, 2004, 2009; Smallwood 2012). In the Southeast, dense concentrations of fluted points have been found along the Atlantic seaboard and along the major drainages of the Midsouth, supporting such an approach to settlement (Fig. 6.1); the extent to which initial

colonizing populations relied on such a strategy is unknown, given people were present in the Americas some time before Clovis. While coastlines are classic linear environments, rendering group interaction difficult for populations strung out along them (Wobst 1976), movement along them may have been rapid enough to mandate the development and use of favored staging or aggregation areas. Such settings may exist, such as river mouths or high peaks along the coast, or prominent near-shore islands along major movement pathways, like Isla Cedros, Isla Ángel de la Guarda, and Tiburón Island on the east and west sides of Baja California (e.g., Des Lauriers 2006, 2011), or on the Channel Islands, which appear to have been reached quite early (Erlandson et al. 2011; Johnston et al. 2002). Bulls Scarp on the continental shelf off South Carolina may have also been such a setting, used for rendezvous and aggregation by early populations (Harris et al. 2013). While the shorelines on the Atlantic and Gulf continental margins would not appear to have been favored settings for group rendezvous and aggregation during the Late Pleistocene, particularly during periods of peak shoreline change, this seems to have been less the case along the Atlantic than along the Gulf Coastal Plain, and only during some and not all periods. Coastal margins of the Gulf were wider and more unstable (i.e., mobile) at times than those on the South Atlantic, which may explain the larger concentrations of Middle Paleoindian sites in the Coastal Plain in the latter area. Determining possible site locations, especially large permanent aggregation sites on the continental shelf, will require careful analysis of topography and take shoreline fluctuations into consideration.

Use of high resolution topographic data from the continental shelf can also prove useful to least coast pathway analyses (LCPA) directed to determining how early peoples moved across the landscape (Anderson 2012; White and Surface-Evans 2012). Early hemispherical scale LCPA didn't consider topography on the continental shelf, primarily due to the coarse resolution of bathymetric data compared with terrestrial datasets then available, and the difficulties of integrating the two (Anderson and Gillam 2000), but such obstacles are rapidly disappearing (Anderson et al. 2010b, 2013; Gillam et al. 2006; Harris et al. 2013). Knowing the topography of the exposed portions of the continental shelf in the Late Pleistocene, particularly in relation to where shorelines were located, will be critical to future LCPA analyses, both for the Late Pleistocene as well as for the exploration of earlier and later (i.e., Holocene) coastal settlement. Topographic data from the continental margins can be useful in documenting where islands as well as submerged lower lying areas once were, as demonstrated by analyses showing the changing archipelago on the south coast of Beringia during the Late Pleistocene (Fig. 6.8), whose existence adds support to maritime adaptations and movement in that region (Anderson 2010; Brigham-Grette et al. 2004; Erlandson et al. 2008; Manley 2002). As sea levels rose and the shoreline advanced onto the Beringian shelf, new islands formed continually, as lower lying areas were flooded. Determining when these islands were exposed and when and if they were subsequently submerged can also provide age ranges for archaeological materials found on them. Minimally, such analyses can suggest areas that might be profitably examined first, to improve search efficiency.

Sometimes surendipitous results may be forthcoming from use of large scale topographic data analyses; a least coast pathway analysis of colonization routes in South America indicated movement east of the Andes, and not along the Pacific coast, was a plausible movement pathway south, and that the Amazon basin might have been first settled from the headwaters rather than the mouth (Anderson and Gillam 2000; see also Sauer 1944 and Magnin et al. 2012). Other forms of evidence, such as linguistic diversity and archaeological evidence suggesting dispersals along large river systems, provide some support for these possibilities (Dahl et al. 2011; Dias and Bueno 2013:348–350; Miotti and Magnin 2012); such routes might have been chosen if the coastline was perceived as an unstable environment, as was likely the case during MWP-1A, as well as during several later intervals.

During the LGM the continental shelf in the vicinity of southeastern USA was over half a million square kilometers larger than it is at present, and nearly a quarter of a million square kilometers, half of this total, was submerged between ca. 20,000 and 10,000 cal year BP (Anderson et al. 2013:190). The archaeological investigation of the submerged continental shelf has received increasing attention in recent decades, with particular attention directed to shorelines, river channel margins, scarps, and



**Fig. 6.8** The island archipelago of southern Beringia ca. 20,000 cal year BP, which would have prompted the development of maritime technology essential to coastal movement among populations living in or passing through the area. This archipelago was in existence throughout the Late Pleistocene, with new islands emerging and old ones becoming submerged as sea levels rose and waters invaded the Beringian Land Bridge. Map based on sea level data in Manley (2002) and Lambeck et al. (2002), elevation/bathymetric data from Amante and Eakins (2009), and a mapping approach adapted from Manley 2002 and Brigham-Grette et al. 2004. Image prepared by Stephen J. Yerka, adapted from Anderson (2010)

chert sources (e.g., Dunbar 2006; Edwards and Emery 1977; Edwards and Merrill 1977; Emery and Edwards 1966; Faught 1996, 2004a, b; Faught and Donoghue 1997; Faught and Guisick 2011; Guisick and Faught 2011; Harris et al. 2013; Holliday and Miller 2013; Lowery et al. 2012; Stright 1990). Prehistoric sites have been found in the northeastern Gulf of Mexico along the paleo-Aucilla River channel, most in fairly shallow waters in areas submerged in the Holocene, although Paleoindian materials have been found on them (Faught 2004a, b). Recently efforts have been directed to shorelines in much deeper waters near the edge of the continental shelf (Hemmings and Adovasio 2014), which the current analysis indicates would have been fairly stable, with changes of only a few meters per decade occurring, during and after the LGM, at least until the onset of the Bølling-Allerød and MWP-1A (Table 6.1; Fig. 6.7). The discovery of archaeological sites beyond the Clovis shoreline, particularly if intact features like hearths were present, would be compelling evidence for human occupation, and sea level reconstructions would provide a means of dating when they were submerged and hence the latest time they could have been occupied.

#### 6.4.1 *The Settlement of Interior North America*

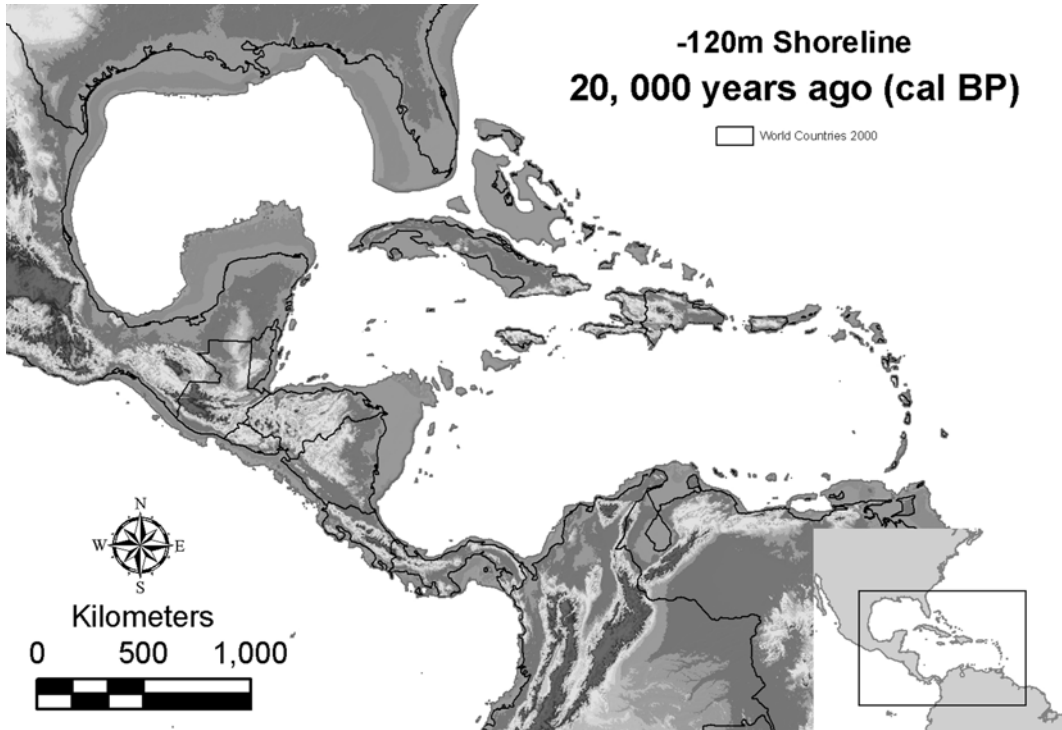
How does examination of sea level rise help us understand the peopling of the Americas, and specifically the settlement of the interior? The lessons from examining the record of Late Pleistocene shoreline change in the southeastern USA are instructive. A number of Early Paleoindian period sites

post-dating the LGM are currently known from interior Eastern North America, including Meadowcroft Rockshelter in Pennsylvania (Adovasio et al. 1999), Cactus Hill in Virginia (McAvoy and McAvoy 1997), Topper in South Carolina (Goodyear 2005), Page-Ladson in Florida (Webb 2006), and Debra L. Friedkin site in Texas (Waters et al. 2011a), to list a few of the better-known sites. While none of these sites is without some degree of controversy (e.g., Dincauze 1984; Fiedel 2013; Morrow et al. 2012), most archaeologists exploring the question of the peopling of the Americas accept that human presence a few centuries to a few millennia prior to Clovis times has been demonstrated (Wheat 2012), although precisely when and along which routes initial entry took place remains unknown. Unfortunately, given the absence of widely occurring and easily recognizable Early Paleoindian diagnostics in North America at present, it is difficult to infer Early Paleoindian period settlement and movement patterns at a large scale. This is not a problem in subsequent periods, beginning with the Middle Paleoindian, due to the widespread occurrence of fluted points on the landscape (Fig. 6.1). The dense concentrations and equally pronounced voids or low density areas suggest people settled into perceived favored areas and may have moved rapidly between such possible staging areas using a leap-frogging movement strategy. Raw material occurrence on diagnostic Middle Paleoindian artifacts also indicates materials moved appreciable distances from sources, another indicator that these early peoples ranged widely and were used to long distance movement (e.g., Anderson et al. 2010a; Daniel and Goodyear 2015; Goodyear et al. 1990; Morrow 2015; Tankersley 1991).

Assuming people were moving rapidly over the landscape, and settling into particularly attractive, resource-rich areas, it seems probable that coastal settings would have been favored during periods of relative stability, and less favored when shorelines were moving rapidly. Given this, it may be possible to predict when coastal settings were occupied, and when movement into the interior may have appeared increasingly attractive. The widespread occurrence of Clovis sites and artifacts in the interior comes when shorelines were starting to change rapidly, after over half a millennium of relative stability, suggesting some of the seemingly dramatic inferred Clovis population increase may derive from peoples moving away from the coast. Clovis may not have been as rapid a radiation as once thought, if Early Paleoindian populations were more focused toward the coastline, perhaps after the changes associated with MWP-1A had subsided, and only moved inland as shoreline instability increased after ca. 13,000 cal year BP.

Lowered sea levels would have also facilitated movement through the Caribbean much as they may have along the south coast of Beringia, by reducing the distances between islands, although to date little evidence has been found for Pleistocene human occupation in the Greater or Lesser Antilles (Fig. 6.9). Wherever people entered the Americas—from the Pacific coast, through the ice-free corridor, or across the ocean—movement could have proceeded quickly among major river systems. Entry from the Pacific northwest could have resulted in people moving down the Columbia River, while populations coming through the ice-free corridor would have encountered major rivers flowing to the east and southeast, like the Missouri, the Platte, the Red, and others, that would have led to the Mississippi–Ohio river system, and hence into much of interior eastern North America, as well as the Gulf of Mexico. Alternatively, populations coming from the northwest may have followed the ice fronts and massive periglacial lakes that were present (see Fig. 6.1), exploiting plants, animals, and aquatic resources near their margins, assuming watercraft weren't employed to explore further into them. As peoples moved east, the great inland Champlain and St. Lawrence Seas may have likewise proved attractive, and these bodies of water and their shorelines would have reacted to sea level changes occurring globally like those in the Southeast, albeit local isostatic effects this close to the ice sheets would probably have been significant. Peoples moving through North America likely targeted flocks of migratory waterfowl, whose southward flights in the fall may have inspired similar movements by human groups living in high latitudes, and may have even prompted movement to the north in the spring, back through the ice-free corridor (Dincauze and Jacobson 2001; Fiedel 2007). A number of apparent kill sites have been found suggesting mammoth were an important food source, such as Hebior and Schaefer in Wisconsin, possibly Hiscock in western New York, Burning Tree in Ohio, and Coats Hines in Tennessee (Deter-Wolf et al. 2011; Fisher et al. 1994; Laub 2003; Overstreet 2005).





**Fig. 6.9** The Caribbean and Gulf of Mexico at ca. 20,000 cal BP, showing how lower sea levels would have facilitated movement throughout the region, including onto the Bahamian shelf and the Greater and Lesser Antilles. Map based on bathymetric and elevation data in Lambeck et al. (2002), and elevation/bathymetric data from Amante and Eakins (2009). Image prepared by Stephen Yerka, adapted from Anderson et al. (2010b)

Humans may have reached unglaciated portions of northeastern North America by 15,000 cal year BP, given that a decline in *Sporomiella* associated with herbivore dung begins about this time, together with a rise in charcoal particulates, suggesting increased fire frequency (Gill et al. 2009; Ferenac et al. 2011).

#### 6.4.2 Movement Along the Pacific Rim

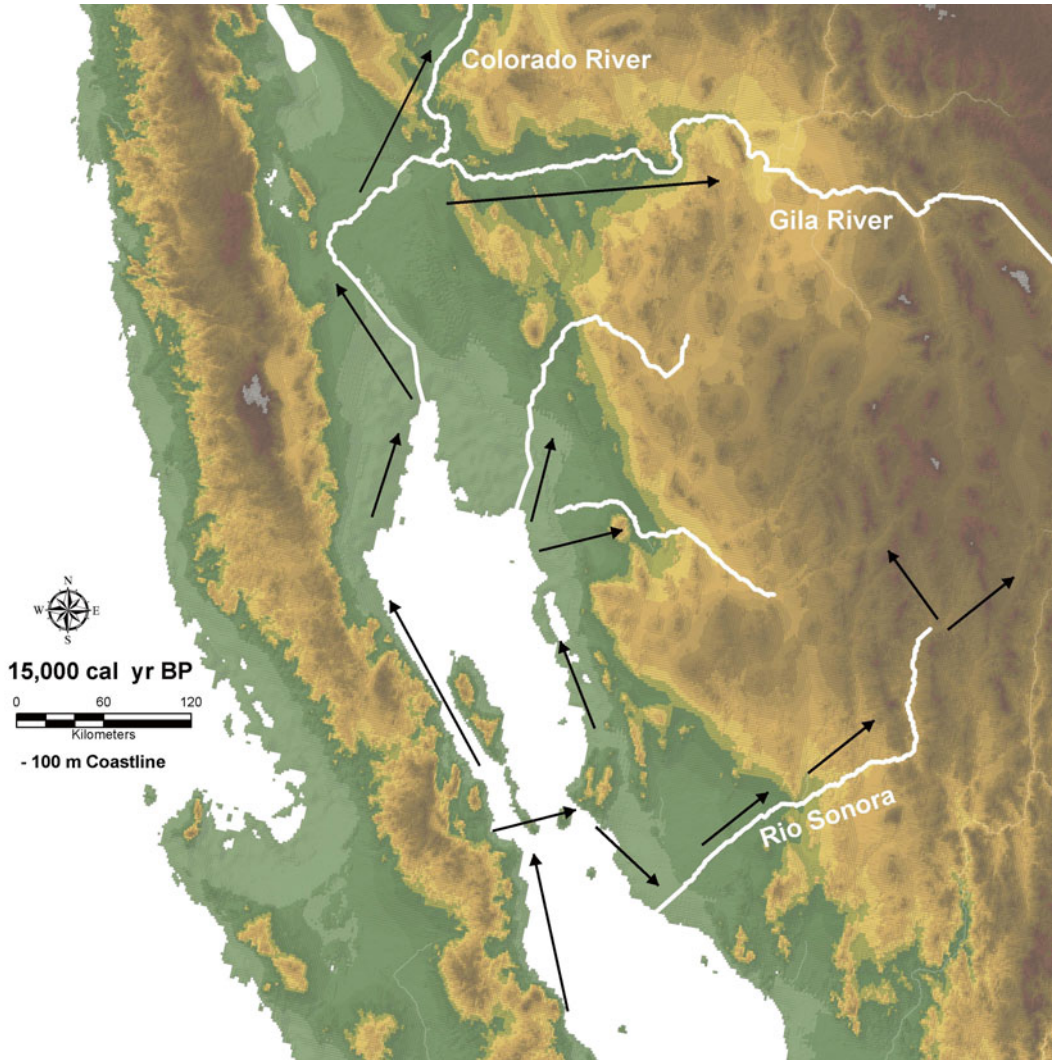
The earliest movement into the Americas, at least from the west, likely occurred in Beringia, either overland or using watercraft to move among the islands dotting the southern margin of the land bridge. Given genetic evidence for a lengthy separation between Asian and American populations, what has been called the “Beringian Standstill” (Tamm et al. 2007; see also Kemp and Schurr 2010; Perego et al. 2009; Schurr, herein), this area may have been occupied for millennia, long enough for local populations to become well adapted to coastal settings, which may have facilitated a subsequent rapid spread southward. This adaptation may have been to rich near-shore maritime environments, what Erlandson and colleagues (2007, 2008) have called the “Kelp Highway Hypothesis” after the kelp forests that occur in colder and temperate settings along much of the Pacific Rim. The survival of dwarf mammoth into the mid-Holocene on islands isolated as Beringia flooded (Stuart et al. 2002; Veltre et al. 2008), however, suggests that either large terrestrial game held little interest to these

peoples (supporting a maritime adaptation), or that sophisticated maritime technology developed fairly late in the region. This does not preclude earlier movement between closely spaced islands and along the coast, however, which didn't require the long distance, open water seafaring required to get to these islands in the mid-Holocene.

A number of early sites have been found in the Pacific Northwest suggesting early movement did occur along the coast. The Manis mastodon kill site in Washington (Gustafson et al. 1979; Waters et al. 2011b) and Paisley Cave in Oregon (Gilbert et al. 2011) both date to about 14,000 cal year BP, and while a spectacular Clovis cache, East Wenatchee, has been found in the same area, it is assumed to be somewhat later, around or after 13,000 cal year BP (Gramly 1993; Mehringer 1988). Populations moving along the coast would have encountered the Columbia River once they were south of the Cordilleran ice sheet, a route that could take them deep into the interior of the continent. Some people may have chosen to follow the river into the interior, which since it passes near the headwaters of the Missouri, may have led them further south and east, ultimately reaching most of the eastern part of the continent. Presumably others or perhaps most or all continued south, since they already had the skills necessary to survive in coastal settings, a choice that may have been viewed as a less risky proposition than moving great distances inland. Some people may have stayed on or near the coast rather than moving on, as evidenced by the sites and assemblages of the Late Pleistocene–early Holocene Western Stemmed tradition, a local tradition possibly coeval with or earlier than Clovis (Beck and Jones 1997, 2010, 2012; Fiedel and Morrow 2012).

Further south, however, few drainages extend deep into the interior along the west coast of the USA, given the occurrence of mountain ranges like the Sierra Nevada and the interior-draining Great Basin further east. The largest drainages in the region, the Sacramento and the San Joaquin, are confined to Oregon and California, and entirely to California, respectively. The basins of these western drainages occupy about the same area as the Western Stemmed Tradition, which may represent the extent of inland movement by coastal peoples. The numerous pluvial lakes in the Great Basin and Southwest in the Late Pleistocene, however, might have facilitated movement further east. Some bodies of water like Lake Lahontan and Lake Bonneville were so immense, however, that they may have been major barriers (Reheis 1999; Reheis et al. 2014), although their margins may have been attractive areas to live and move along (Graf 2007). The presence of sites like East Wenatchee suggest Western Stemmed Tradition peoples may have encountered Clovis peoples arriving from further east, if that is where Clovis culture originated. When and if people passed through the ice-free corridor from the north, furthermore, if any turned west they may have settled or helped settle the Pacific Northwest, and interact with Western Stemmed Traditions peoples, or create the tradition itself. Numerous fluted points are present in western Canada (Ives et al. 2013:155), and the relationship between these major cultural traditions needs to be better understood.

As people continued south along the Pacific coastline, they literally ran out of land at the end of Baja California, and would have had to turn back to the north and move along the east side of the peninsula, unless they had watercraft capable of crossing the Gulf of California to Sinaloa, a distance of more than 100 km, even given Late Pleistocene lowered sea levels. As they moved northward, several closely spaced islands near the northern end of the Gulf of California, Isla San Estaban, Isla San Lorenzo, and Tiburón Island, and the nearby Isla Ángel de la Guarda, would have facilitated crossing to the eastern shore in Sonora, and from there into the interior along rivers like the Sonora and, further north the Colorado and the Gila (Bischoff and Niemitz 1980) (Fig. 6.10). Large numbers Late Pleistocene sites and artifacts have been found in Sonora in recent decades, which suggests early settlement (Gaines et al. 2009; Sanchez 2010; Sanchez et al. 2014). At the northern end of the Gulf of California lies the mouth of the Colorado River, one of the largest drainages in North America, whose basin lies a short distance from the basins of the east and southeast flowing Arkansas, Plate, and Missouri River systems, the same routes to the east that people coming in from the north may have followed (Anderson 2013; Anderson et al. 2013). Near the mouth of the Colorado is the Gila River,



**Fig. 6.10** The Baja California/Sonora/Colorado River model for the colonization of Interior North America: possible movement pathways into the interior at the northern end of the Gulf of California. Rivers in Sonora are easily reached in the vicinity of Isla San Estaban, Isla San Lorenzo, and Tiburón Island, and the nearby Isla Ángel de la Guarda. The large numbers of early points and sites in Sonora may be the result of early settlement. Further to the north, the Colorado River and its major tributary the Gila offer major routes into the interior to the north and east (Image prepared by Stephen Yerka using topographic data from Amante and Eakins 2009; adapted from Anderson 2013:393)

which flows eastward towards the Rio Grande, another pathway leading ultimately to eastern North America. While some people may have continued into the interior along the Sonora, Colorado, and Gila Rivers, others may have continued south down the coast, eventually reaching South America, perhaps crossing over to the Gulf of Mexico or Atlantic coasts. Some of the earliest settlement of interior North America, particularly eastern North America, may have been by peoples coming from the west or southwest, from the Colorado or Gila River basins and from there moving down major east and southeast flowing rivers and, once they reached it, northward from the Gulf of Mexico.

## 6.5 Conclusions

Consideration of physiographic and climatic change is crucial to understanding how the Americas were colonized in the Late Pleistocene. At the present, while we remain uncertain about when, where, and how the first peoples arrived, a vast amount of research is underway on the subject, and there are plenty of exciting scenarios to consider. Modeling exercises like those discussed here are different than primary archaeological fieldwork, but both have to occur if our understanding of the past is to advance, and particularly if we are to know where on the landscape to look for early sites. Sea level fluctuations and how they determined the location and movement of shorelines, we have seen, played out very differently across the American Southeast, meaning great care must be taken when considering how coastal areas were used as humans moved across the globe. By making primary data available and accessible to all, furthermore, our models can be evaluated and improved, and our picture of the colonization of the Americas will become ever more detailed.

**Acknowledgments** We wish to thank the organizers and sponsors of this “Great Migrations” session for the invitation to attend and submit a paper to the proceedings volume. Just as the initial settlers of the Americas may well have come from Central Asia in the vicinity of Kazakhstan, another great human migration, hopefully the greatest of all, likewise started from Kazakhstan. The launching of the first artificial satellite in 1957, and of the first human to orbit the earth in 1961, Yuri Gagarin, may someday be recognized by peoples living in unimagined vistas across our solar system and beyond as a major turning point in human history, the expansion of our species off the planet and out into the universe. It was an honor to meet and interact with the poet and scholar Olzhas Suleimenov, who documented Gagarin’s achievement in his epic poem “Earth, Hail Man”. Finally, in the writing of this chapter, we thank our colleagues Stuart Fiedel, J. Christopher Gillam, Joseph Gingerich, Ted Goebel, Albert C. Goodyear, D. Shane Miller, Douglas Sain, Ashley M. Smallwood, Mike Waters, and Stephen J. Yerka for their advice about our analyses and various colonization scenarios. The data used in the current analyses is available on request and has been posted online on the PIDBA website at <http://pidba.utk.edu/>. We also thank Michael Fracketti, Robert Spengler, and K. Sharmila for outstanding help with the copy editing and production of the manuscript. Finally, Stephen J. Yerka deserves thanks for his help producing some of the figures used in this chapter.

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# Chapter 7

## Early Asiatic Migration to the Americas: A View from South America

Gustavo Politis, Luciano Prates, and S. Ivan Perez

### 7.1 Introduction

For decades, the peopling of the Americas has been one of the central subjects of American anthropology (Meltzer 2009; Willey 1985) and, beyond a few certainties and the abundance of data presently available, there are still central points of the problem that remain unresolved. The answer to yet valid questions has become even harder because the debate has been polarized by opinions that sometimes seem more like acts of faith than hypotheses based on modern scientific criteria. In this summary, we will succinctly offer an overview of the current state of discussion on this matter, seen from the perspective of South America. Under discussion will be the main ideas that have sought to explain when and how the continent was populated, and what relative degree of validation each concept enjoys today. We will lay special emphasis on the integration of data from the context of South American archaeological sites.

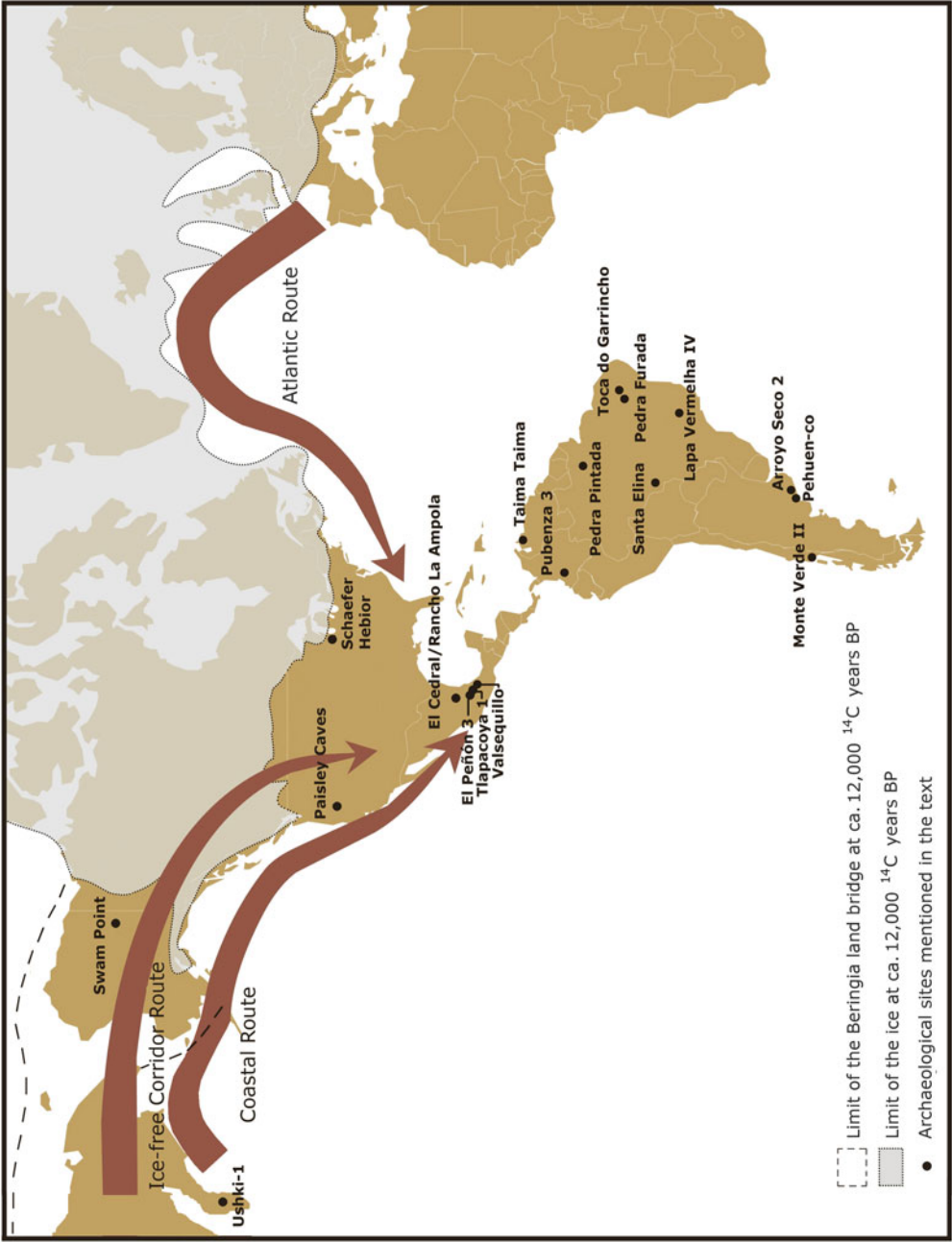
### 7.2 North America

On the basis of diverse lines of evidence (archaeological, genetic, and paleoenvironmental), little doubt exists that the arrival of the first humans to the continent took place from Siberia via the Bering land bridge (Beringia), or along its coast by a littoral or sea route (see discussion in Madsen 2004) (Fig. 7.1). This bridge was not temporally continuous but rather emerged during freezing episodes recorded during glaciations. Though exposed between around 27,000 and 11,000  $^{14}\text{C}$  years BP, the continental ice covering a good part of the Northern Hemisphere would have made entry into North America impractical via the interior between ca. 22,000 and 12,000  $^{14}\text{C}$  years BP (the opening of an Ice-Free Corridor probably occurred between ca. 12,500 and 12,000 years  $^{14}\text{C}$  BP, see Dixon 2013) and via the Pacific coastal strip between ca. 18,000 and 15,000 years  $^{14}\text{C}$  BP (Clague et al. 2004; Mandryk et al. 2001). Alternative hypotheses to an entry via Beringia, such as the provocative proposal of Dennis Stanford and Bruce Bradley (2013; see also Bradley and Stanford 2004), have not yet proved tenable or backed by strong evidence. Although there are some striking technological and

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**Fig. 7.1** Map showing the main archaeological sites mentioned in the text and alternative routes for entering America



morphological similarities between the Solutrean and some Clovis and Pre-Clovis artifacts, the genetic evidence does not support a European Upper Paleolithic intrusion into North America at the end of the Pleistocene (Rasmussen et al. 2014). None of the other proposed routes, from Australia and Polynesia across the Pacific, or from Africa across the Atlantic possess any serious proof to back them. This is not necessarily to deny that during the Holocene there may not have been some trans-oceanic contact with Europe, Polynesia, or Africa, but that, had such existed, it will not have been early or massive, or involved in the center scene of the initial population of the continent.

In the light of the growing archaeological data generated so far in northeast Asia and by means of simplifying the great complexity arising there, several general trends can be recognized. Central Siberia was already occupied between 30,000 and 25,000  $^{14}\text{C}$  years BP and, from there, Paleolithic people could have reached the Arctic region during a warm period before the Late Glacial Maximum (henceforth LGM), starting around 20,000  $^{14}\text{C}$  years BP. Though some authors have suggested the crossing of Beringia and entry to America took place even before the LGM (e.g., Madsen 2004), the most solid records of occupation on both sides of the intercontinental bridge show a chronology not surpassing 12,000  $^{14}\text{C}$  years BP had come from the Ushki-1 (Kamchatka) site in far East Asia (Goebel et al. 2010), and that of Swam Point, in central Alaska (Goebel et al. 2008). Though no undisputed evidence of occupations prior to this chronological baseline in the northwest of North America has been recorded, several sites to the south of the Laurentide Ice Sheet, in the modern United States territory, show clear evidence of occupations earlier than 12,000  $^{14}\text{C}$  years BP. Though we will not go too deeply into this point, the Schaefer and Hebior (Wisconsin) sites, with evidence of exploitation of proboscideans some 12,500  $^{14}\text{C}$  years BP (see discussion in Goebel et al. 2008) and the Paisley 5 Mile Point Caves (Oregon) site, where several coprolites were determined as belonging to *Homo sapiens*, dated at ca. 12,300  $^{14}\text{C}$  years BP (Thomas et al. 2008), may be mentioned. Although still controversial in some aspects, the Meadowcroft Rockshelter also has to be considered (Adovasio et al. 1998).

Shortly after these first human signals, indications appear in North America of megafauna hunters associated with Clovis technology. According to a re-evaluation of the chronology of all sites carried out by Waters and Stafford (2007), these groups dispersed throughout the greater part of present-day United States between 11,050 and 10,800  $^{14}\text{C}$  years BP. During that time the populating process of the Northern Hemisphere gets very complex, and humans occupied most of its territory (plains, coast, and peri-Arctic and subtropical zones), not only by hunters specializing in megafauna, such as those employing Clovis technology, but also by societies with very diverse adaptation strategies. With big-game still dominating in most subsistence scenarios of early American hunter-gatherers, some authors have argued that plants and small animals, thought to be more in purview of women's labor, played a more significant role in Paleoindian subsistence (see discussion in Kornfeld and Politis 2014).

## 7.3 South America

### 7.3.1 Controversy over an Early Peopling of the Continent

In contrast with most of North America, information on early human occupations in the south of the Northern Hemisphere is scant and in many cases still ambiguous. In the territory of present-day Mexico, there were several studies defending some pre-20,000 years old human evidence (see e.g., Mirambell 1994). Nevertheless, the accuracy of the descriptions of materials and methodologies employed for their analysis seems to be insufficient to seriously consider them proofs of an early population of America (Acosta Ochoa 2007; Politis et al. 2009). As examples, several sites such as Rancho La Ampola and El Cedral (San Luis de Potosí), Tlapacoya 1 (Mexico basin), and Valsequillo (Puebla) can be mentioned. The main problem with all these sites is the difficulty in determining whether the dated materials are the same age as the archaeological evidence recorded there and, in some cases, if this evidence is really human-generated material. In the case of Valsequillo, the presence of

human tracks on a layer of volcanic ash dating ca. 40,000  $^{14}\text{C}$  years BP (González et al. 2006) was also proposed. This hypothesis was criticized by a team of researchers that pointed out the age of the sediments carrying the presumed prints was more than a million years old; therefore, the idea that they might be human became untenable (Renne et al. 2005). More recently, from a morphological and morphometric study of the marks based on the biomechanical principles of walking, Morse et al. (2010:2577) concluded that “These marks no longer appear tenable as human footprints and should be dismissed from this debate.”

Even taking into account that the hypothesis of a very ancient occupation of Mexico lacks empirical backing, it should be indicated that strong evidence for a para-Clovis human presence in this sector of the continent is supported. Standing out among this evidence are the human remains from  $11,650 \pm 60$   $^{14}\text{C}$  years BP found at the Naharon site, in the Yucatán peninsula (Quintana Roo) (González González et al. 2006; González González and Rojas Sandoval 2004). The dating was carried out on a woman’s bone and is the most ancient direct date in the Americas. A new human skeleton from the same region was recovered from inside a cave system submerged by the rising Atlantic coast. The recent dates from the human sample from the Hoyo Negro site gave ages of  $10,970 \pm 25$  and  $10,985 \pm 30$   $^{14}\text{C}$  years BP (Chatters et al. 2014). These dates are also supported by a series of Uranium-Thorium dates made on calcite from the human bones. Advances in studies of this kind of site and the growing number of dates make this one of the most interesting and promising challenges for the present territory of Mexico in particular and the debate on American colonization in general.

Archaeological information from North America in general terms over-shadow that observed in South America, where there is no site that can be firmly dated as older than 13,000  $^{14}\text{C}$  years BP. In the cases where early dates have been proposed, associations are not clear enough, nor have they been conclusively validated. Even so, there are some sites reserved as interesting candidates to go beyond this chronological barrier, but these sites require a greater degree of chronological and contextual resolution and greater detail in the publication of basic data. One of these is Pedra Furada (Parenti 2001), where the most recent research on lithic technology and chronology (Boëda 2010) attempts to solve some of the inconsistencies mentioned by different researchers regarding the natural processes in the formation of the site (e.g., Borrero 1995; Meltzer et al. 1994). Despite the publication of Parenti’s (2001) thesis, and of several articles by Guidón and his team, the site must still be published in greater detail so as to better evaluate the conditions of the find. Other candidates, which require additional information, are the sites of Pubenza 3, on the Magdalena River in Colombia, and the Santa Elina shelter, in Mato Grosso State, Brazil. As for the first, Correal Urrego et al. (2005) made public megafaunal remains associated with artifacts with supposed evidence of use dated to ca. 16,000  $^{14}\text{C}$  years BP. As for the latter, two very ancient levels were found with remains of a ground sloth (*Glossotherium*) associated with some lithics with chronologies between 22,000 and 27,000  $^{14}\text{C}$  years BP (Vilhena Vialou 2005). If either of these sites effectively managed to provide reliable dates presented for human occupations of their deepest levels and were better able to defend the contextual associations, we would then seriously have to consider an arrival chronology predating the LGM, in other words over 18,000  $^{14}\text{C}$  years BP. The last site which arrived into this discussion is Arroyo del Vizcaino, Uruguay (Fariña et al. 2014). In this site, possible cut-marked megafaunal bones dated to ca. 29,000  $^{14}\text{C}$  years BP were recovered in association with a few lithics flaked by humans. This possibility remains open, but awaits stronger arguments and a better understanding of the site formation process in order to be validated.

### 7.3.2 South American Occupation: 12,000–13,000 $^{14}\text{C}$ Years BP

The most ancient dates with the greatest degree of confidence in South America go back to the time period between 12,000 and 13,000  $^{14}\text{C}$  years BP. The main ones are from the sites of Monte Verde, in the south of Chile (Dillehay 1989, 1997, 2000), and Arroyo Seco 2, in the Argentine Pampa region

(Steele and Politis 2009; Politis et al. 2014). There are additional pre-12,000  $^{14}\text{C}$  years BP-dated sites, which could be added here; however, their chronologies and contexts still present weaknesses needing to be resolved so as to be fully incorporated into the debate on early peopling. Among these are Taima Taima in northwest Venezuela (Ochsenius and Gruhn 1979), Lapa do Boquete (Fogaça 2001), Toca do sitio do Meio (Guidon 1986), and Toca do Garrincho (Guidon et al. 2000) in Brazil (see discussion in Bueno et al. 2013), and Pehuen-co on the coast of the Pampas in Argentina (Bayón et al. 2011). Here we will briefly refer to the last two, as well as Monte Verde and Arroyo Seco 2.

The Pehuen-co site today is on the Pampean coast, but during the Late Pleistocene was hundreds of km into the continent (see evolution of the coast line in Fig. 7.2). This site was on the shores of a temporary Pampas pond in the Late Pleistocene and shows an exceptional record of animal footprints and tracks on a sediment platform extending 5,000 m along the modern coast (Manera de Bianco et al. 2008). The process of sedimentation and animal trampling repeated quite regularly, each after a short period of time, generating overlapping layers. The palaeoichnological record shows more than 100 trackways and hundreds of isolated footprints of different ichnogenra including Megatheriidae, Mylodontidae, Glyptodontidae, *Macrauchenia*, Camelidae cf. *Hemiauchenia*, *Lama*, Equidae, *Stegomastodon*, Carnivora (Ursidae, Canidae, Felidae), and Caviidae. One sample of organic matter coming from the middle levels of the sedimentary layers containing the footprints of Pleistocene fauna gave an age of  $12,000 \pm 110$   $^{14}\text{C}$  years BP, and a new set of radiocarbon sampling of the site is currently in process by Thomas Stafford Jr. This kind of novel record is a valuable source in the study of available fauna during the early period of human occupation of the Pampa region. In addition to the megafaunal record, in 2005 two isolated human footprints and a trackway were found at the same site (Bayón et al. 2011). The footprints were found on large pieces of clayey sediment, separated from the original layer by the tide; and the track is composed of 13 consecutive footprints, with alternating traces of the right and left foot, as in a walking situation and, hence, they may correspond to only one individual (Bayón et al. 2011; see Fig. 7.3). It seems that what is left is the undertrack since the upper layers have been eroded by the sea (see Marty et al. 2009; and the “undertrack model” in Fig. 7.3c). In the same layer, there is a parallel *Megatherium* trackway also containing *Macrauchenia*, Artiodactyla, and flamingo trackways crossing the human one in different directions. Though the human footprints have not been studied in depth owing to the fact that they are permanently buried by the sand of the present-day inter-tidal zone, this site is an extremely relevant record for a future research agenda.

At Toca do Garrincho several *Homo sapiens* remains (a fragment from the fronto-parietal region of the cranium, a fragment of a jaw with the first molar, and an isolated tooth) “with archaic features” were discovered (Peyre et al. 2009). A conventional radiocarbon date was obtained from these remains at ca. 12,200  $^{14}\text{C}$  years BP (Guidon et al. 2000). However, the date is on carbon from the acid pretreatment washes of a composite sample of two human teeth, which produced insufficient collagen for dating after pretreatment (Bueno et al. 2013). Guidon et al. (2000) report this result, commenting that readers can then make their own judgment; therefore, this date requires a bit of caution.

The best known and most accepted pre-12,000  $^{14}\text{C}$  years BP site in South America is without doubt that of Monte Verde in southern Chile. This site has been published in detail in several articles and books (e.g., Dillehay 1989, 1997). At Monte Verde II, discoveries include: hearths; the foundations of wooden leather-covered dwellings; mastodon remains; and a great variety of wood and plants remains. In a more recent publication on the site, the discovery of several species of marine algae dated at ca. 12,300  $^{14}\text{C}$  years BP (Dillehay et al. 2008) was also made known. The remote provenance of this aquatic resource and the impossibility of its having entered the context through non-human agency validate its anthropic genesis even further. The chronology of the site has been established at ca. 12,400  $^{14}\text{C}$  years BP by averaging 16 dates from the same component. What is interesting about Monte Verde II, besides its confrontation with the “Clovis First” model, is that it suggests that the human groups that occupied it had an economy focused on the exploitation of a great diversity of animal and plant resources, a very different pattern from that of specialized hunters connected with Clovis technology.

In the Pampa region, there is a human signal, although it is still weak, at the Arroyo Seco 2 site (130 km northeast from Pehuen-co). At this site, some Pleistocene mammals were dated (see Fig. 7.4);

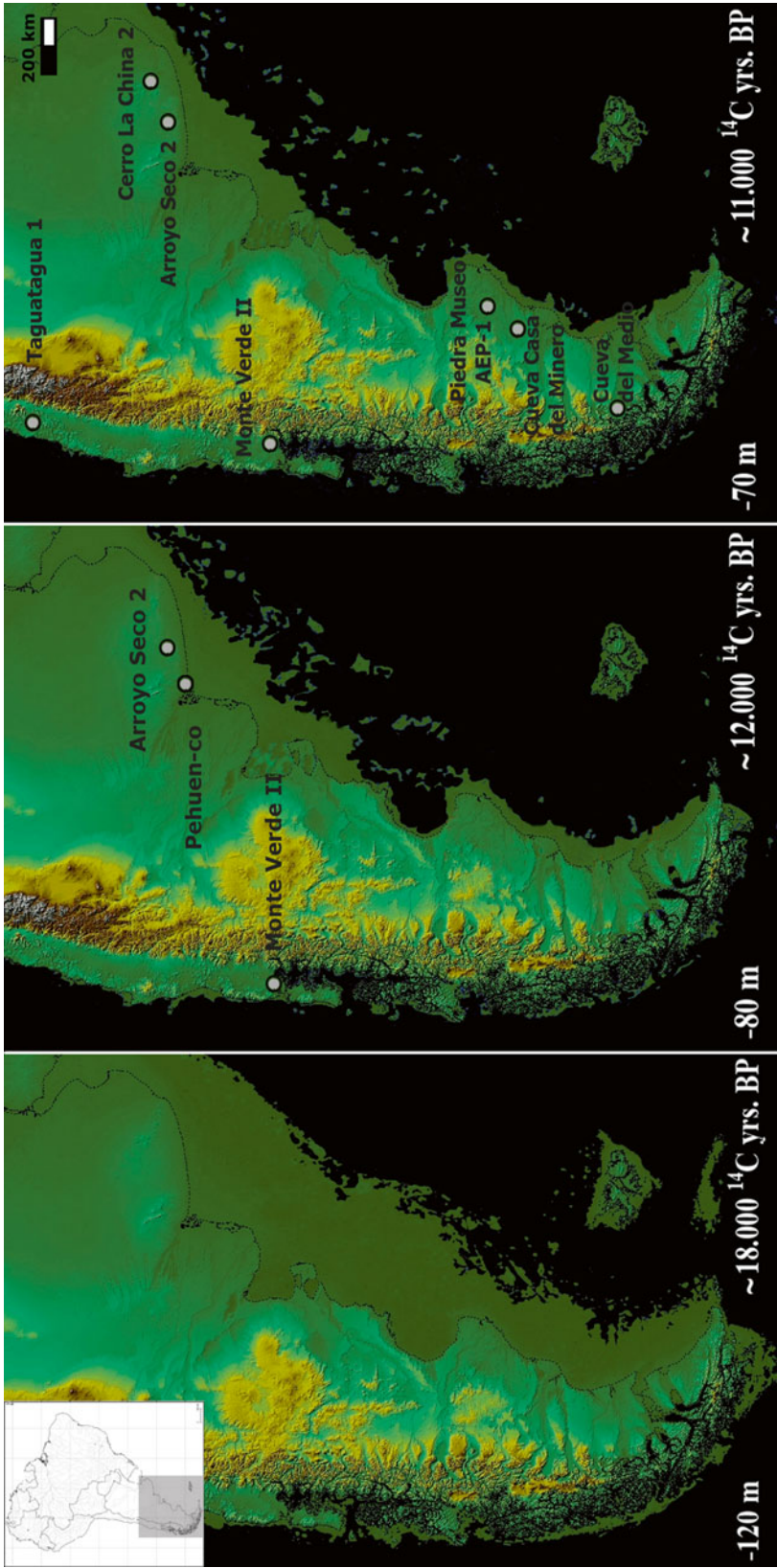
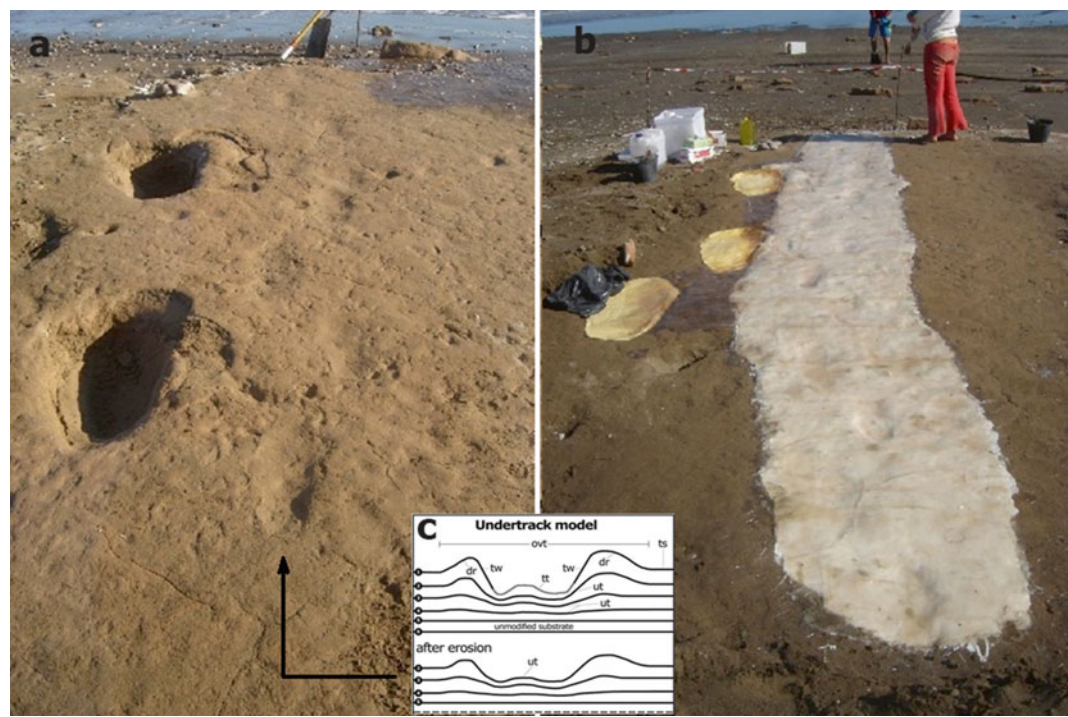


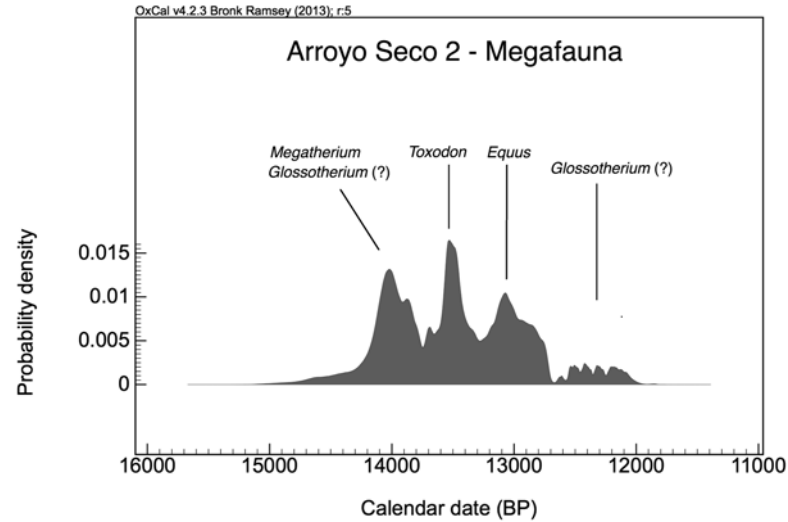
Fig. 7.2 Map showing the changes of the coast line in southern South America during the Late Pleistocene—main sites per period are also indicated





**Fig. 7.3** Photos showing the human trackway of Pehuen-co site. (a) Trackway as it was exposed in 2005 (b) Cast of the trackway taken by Manera and her team (c) Undertrack model before and after erosion (taken from Marty et al. 2009). Photos (a) and (b) courtesy of Teresa Manera

**Fig. 7.4** Sum of probabilities of the Late Pleistocene  $^{14}\text{C}$  dates from Arroyo Seco 2, based on 14 dates (taken from Politis et al. 2014)



*Megatherium* and *Equus* bones have some evidence of human processing (fresh bone fractures) and were associated with stone tool use, to ca. 12,200  $^{14}\text{C}$  years BP (Steele and Politis 2009; Politis et al. 2014). Another dating on a *Toxodon* bone was estimated at 11,750  $^{14}\text{C}$  years BP, although in this case no human action was verified. Finally, a third event was dated to ca. 11,200  $^{14}\text{C}$  years BP, involving two equids present in the Late Pleistocene: *Equus* and *Hippidion*. This event exhibits more clear evidence of human agency (Gutiérrez 2004; Politis et al. 2014). It is important to highlight that the fauna of Arroyo Seco 2,

dated to the end of the Pleistocene, also include other genera, such as *Glossotherium* and Camelidae cf. *Hemiauchenia*, all of which were also represented in the Pehuen-co Pleistocene paleoichnological site (Manera de Bianco et al. 2008), suggesting that both sites show a similar faunal composition, but in different kinds of records.

Though the scarcity and great geographical distribution of the archaeological signal in South America may indicate a low density of occupation and a newly arrived people in a new continent, the evidence from Monte Verde II suggests a more complex picture: populations established during lengthy periods in a single spot, with a fairly wide ranging knowledge of the environment and its resources. However, the kind of life proposed for the inhabitants of Monte Verde has not been found in any other Late Pleistocene site in the Americas. The closest might be the case of the Monte Alegre (Brazil), at which, beyond some discussions as to its chronology (see Fiedel 1996), a strong emphasis was recorded on the exploitation of the Amazonian forest (above all, fruits, seeds, small vertebrates, and mollusks) some 11,000  $^{14}\text{C}$  years BP (Roosevelt et al. 1996; and discussion in Bueno et al. 2013).

Except for the evidence of human presence at Monte Verde, Arroyo Seco, Pehuen-co, and Toca do Garincho, no archaeological evidence has been recorded from before 11,000  $^{14}\text{C}$  years BP, when the number of sites multiplies and there are already indications of human occupation in most South American environments. In the Southern Cone, several occupations were reported in Pampa-Patagonia for this period: Arroyo Seco 2 (Politis et al. 2014), Cerro La China 2 (Flegenheimer 1987), Cerro de los Burros (Meneghin 2005), Cerro Tres Tetras (Paunero 2003), Piedra Museo AEP-1 (Salemme and Miotti 2008), and Cueva del Medio (Nami and Nakamura 1995), and also from central and southern Chile: Los Rieles and Taguatagua 2 (Jackson et al. 2012; Núñez et al. 1994, see Fig. 7.2). The same trend can be observed in other parts of South America, for example, the central coast of Perú and northern Chile: El Palto CA-9-89 (Dillehay 2011), Quebrada Jaguay 280 (Sandweiss et al. 1998), Amotape PV-8-29, (Rademaker et al. 2013), and Quebrada Santa Julia (Jackson et al. 2007; Méndez 2013), and the savannahs and tropical forests of Brazil: Lapa do Dragao and Lapa do Boquete (Bueno et al. 2013; Prous 1986; Prous et al. 1996/1997). The diversity of environments, adaptations, and technologies from these sites strengthens the idea that there were already people inside the continent before 11,000  $^{14}\text{C}$  years BP, as it would be hard to explain such a rapid demographic expansion and an adaptation to such diverse environments. An intense archaeological signal is clearly detected after 11,000  $^{14}\text{C}$  years BP and a subsequent expansion from around 10,700  $^{14}\text{C}$  years BP, which may have been associated with a new technology that included, among other artifacts, the fishtail projectile point (see recent revisions in Castiñeira et al. 2011 and Nami 2013; also see Chap. 5). This projectile point in the South American Southern Cone is characteristic of a period within the early American settlement generally associated with Pleistocene faunal exploitation (Fig. 7.5).

**Fig. 7.5** Cast of a fishtail projectile point from Cerro La China (Pampas, Argentina). Courtesy of Nora Flegenheimer





### 7.3.3 *South America After 10,000 <sup>14</sup>C Years BP*

One millennium later, most of the major American regions were already occupied by indigenous groups that diversified their life modes and adapted to very different conditions. This efficient regional adaptation by Late Pleistocene and early Holocene hunter-gatherers has led Dillehay et al. (2003) to propose that this might be partially explained by the early emergence in South America of an incipient socio-economic complexity. This early complexity will have provided the conditions for a series of revolutionary changes that came about shortly after, and which substantially transformed these societies. The said changes included cultigens in Peru, perhaps some 8,000 years ago, pottery production at least 6,000 years ago in some spots of Colombia, Ecuador, and probably Brazil, the development of human body mummification some 7,000 years ago in northern Chile, and the beginning of monumental architecture in Ecuador and Peru around 5,000 years BP.

## 7.4 Peopling of the Americas: Other Lines of Evidence

As a complement to archaeological information but with ever-increasing inherent force, biological information of present-day and pre-European populations has gradually clarified certain topics pertaining to the peopling of the Americas. In the first place, genetic evidence clearly shows American populations to be of Asiatic origin, probably from the middle of Asia (Fagundes et al. 2008; Schurr 2004; Schurr and Sherry 2004; see also Chap. 4). This evidence also indicates that biological differentiation among populations was probably a local phenomenon and not the result of multiple migrations (with the probable exception of Aleutian-Eskimo groups) (Merriwether et al. 1995; Perez et al. 2009). However, biological evidence is weaker when considering the moment the first humans arrived in the Americas. Though some of the latest estimates (for instance Silva et al. 2002) regarding the time of arrival agree with archaeological information, it is clear additional studies are still necessary in order to offer a greater degree of resolution.

Mitochondrial DNA (mtDNA) studies of present-day populations have had a profound influence on our vision of the earliest indigenous American population (Fagundes et al. 2008; see Chap. 4 for a more detailed discussion). Even though limitations exist in the exclusive use of genetic data of contemporary populations in assessing the evolutionary history of early Americans, ancient DNA (aDNA) studies have proved to be very useful in evaluating models generated on the basis of modern mtDNA. Notwithstanding, these studies are still limited in number and, principally, the remains from the end of the Pleistocene that have been analyzed are scarce (Chatters et al. 2014). This obscures the mitochondrial variation of this crucial period, clouding our understanding of the origin and evolution of the earliest human populations in the Americas. It is necessary to count on a greater store of aDNA information from the end of the Pleistocene and early Holocene so as to arrive at a better understanding of the variation and evolutionary history of the first Americans.

Similarly, and as several authors have made clear, craniofacial morphological evolution in the Americas is a problem requiring greater research (Perez et al. 2009; Powell and Neves 1999; Chap. 8). Available samples from the LGM to date cannot be used to study the craniofacial morphological characteristics of the first American people (those of the end of the Pleistocene). If we accept that the earlier occupations occurred some 14,000 or 15,000 years <sup>14</sup>C BP, the most studied skeletons from Lagoa Santa and Tequendama (dated between 9,000 and 6,000 years <sup>14</sup>C BP) belong to populations that inhabited South America some 7,000–5,000 years after the entry of the first settlers. The analysis of these sites, together with others from the same time (such as Arroyo Seco 2 and Baño Nuevo), only allows us to address craniofacial variation in the early/mid Holocene of South America. Due to the elapsed time since the initial peopling of the continent, the causes of the craniofacial morphological variation of these people could be discussed in light of microevolutionary factors acting locally during

the initial millennia of settlement. In this sense, if we make use of craniofacial morphological evidence for the study of the American peopling process, we must consider some characteristics of the factors that caused the craneo-skeletal traits so as to correctly interpret results. Craniofacial morphological differences between the two different populations can be the result of the action of factors like natural selection or genetic drift on inherited variation (Perez et al. 2009; Powell and Neves 1999). Additionally, craniofacial morphology can vary due to the action of environmental factors that produce non-inheritable modifications during an individual's development (called phenotypic plasticity). Thus, natural selection and phenotypic plasticity could generate morphological similarities between two early American populations, or an American and a non-American existing in similar environmental contexts, but having no close genetic relationship. This situation could lead to an erroneous interpretation of morphological similarities between two populations if it is assumed they only represent relatedness, that is, evolutionary relations (Perez and Monteiro 2009).

The problems presented by morphological information in the study of American settlement can be illustrated if we think of the peopling of southern South America. The study of evolutionary relationships among human populations in this region was, until recently, limited to morphological data. However, at the beginning of 2000, a mitochondrial DNA study published by Moraga et al. (2000) showed that all the sequences obtained in southern Patagonia and Tierra del Fuego are easily ascribed to the C and D Amerindian haplogroups (similar results were obtained by García-Bour et al. 2004). So, the available genetic information indicates that craniofacial morphological differences observed between the populations of Tierra del Fuego, southern Patagonia, and the remainder of the early American populations have arisen locally and are not related to the retention of ancestral morphological characters and geographical isolation of the populations of Tierra del Fuego, as has frequently been supposed (see a wider discussion of this matter in Perez et al. 2007).

## 7.5 Conclusion

To sum up, and considering palaeoenvironmental, bioanthropological, and archaeological evidence, it becomes clear that the model called Clovis-First irremediably tends to be discarded as an explanation of the initial entry of human societies in America, not only because there are already trustworthy traces of previous occupations, but because the variability and spatial distribution of groups contemporary with and immediately later than Clovis are extremely high. In addition, this model has as one of its main substantiations the premise of a highly rapid dispersion of the "Clovis people," in which case their correlates should be found in Siberia, something that has not happened so far.

So then, given that there were already humans in the Americas before Clovis, the question is: when did they arrive? Although it is not possible to give a definitive answer to this, in principle it is quite unlikely this could have happened between 18,000 and 15,000 <sup>14</sup>C years BP as the continental ice would not have allowed it, even along a littoral route (Clague et al. 2004; Mandryk et al. 2001). Neither can an arrival prior to the period 25,000–18,000 <sup>14</sup>C years BP be dismissed, as proposed by Davis Madsen (2004), but for now no solid, absolutely reliable evidence exists to support this. Therefore, the most parsimonious hypothesis proposes a slightly later arrival, possibly ca. 15,000 <sup>14</sup>C years BP. If it actually happened this way, the passage must have been made along the littoral of the south of Beringia and northwest North America, the only free space of continental ice until the opening up of the Alberta corridor some 11,500 <sup>14</sup>C years BP (as was initially proposed by Fladmark [1979] and later seconded by other researchers such as James Dixon, Darly Fredje, George Wisner, among many others). At the same time, this implies that a good number of sites generated by these first immigrants are presently under the ocean.

In the case of the Southern Hemisphere, the first human evidence (e.g., Monte Verde and Arroyo Seco 2) predates the earliest Clovis signal (Waters and Stafford 2007). Nevertheless, it also clearly

emerges that there are no reliable sites more than a few millennia earlier than Clovis (see Bueno et al. 2013; López Mazz 2013; Méndez 2013; Prates et al. 2013; Rademaker et al. 2013), which also agrees with a pre-Clovis but post-LGM entering. If this is so, the spread of fluted projectile point technology in this part of the continent, with an age around 11,000–10,000 BP (Castiñeira et al. 2011; Prates et al. 2013, and probably somewhat earlier, Nami 2013), must have been associated with a second pulse of peopling, probably through the Ice-Free Corridor (Pitblado 2011).

An age of ca. 15,000 <sup>14</sup>C years BP for the first migration pulse coincides with certain models based on mtDNA proposing that the initial differentiation of indigenous American haplogroups will have occurred about 20,000–15,000 <sup>14</sup>C years BP (Fagundes et al. 2008; Schurr and Sherry 2004; Silva et al. 2002) and approaches closely the chronology of 13,500 <sup>14</sup>C years BP proposed by Kemp et al. (2007) on the basis of the ancient mtDNA study. In addition, there is concordance with some suggestions based on craneometric studies, such as those by Neves and Pucciarelli (see for example Pucciarelli 2004) on the entry of a first paleo-American population between 20,000 and 15,000 <sup>14</sup>C years BP. Finally, a date of ca. 15,000–14,000 <sup>14</sup>C years BP also coheres with chronology available for the early sites in Siberia.

To round off this synthesis about the origins of American indigenous people, we must conclude that, just as with so many other subjects of contemporary archaeology and anthropology, we are still far from a final answer. The signal of the human presence in South America before the LGM is still weak and intermittent. It could be the expected demographic signal for a low population density in a situation of reconnaissance, resulting in isolated bands with high mobility and the lack of production of dense archaeological deposits (see for example Salcedo Camacho 2014). Or, on the contrary, this weak signal could be simply a false signal produced by natural processes, which would mimic human activity. Currently, the last possibility seems to be most probable but the former cannot be ruled out.

We presently propose that the first humans arrived on the northern continent from the northeast Asian some time at the end of the Pleistocene, approximately 15,000 or 14,000 <sup>14</sup>C years BP. A short time later they had already reached South America. We also know they were *Homo sapiens*, anatomically modern humans, and that they had a hunter-gatherer lifestyle, highly nomadic, and maybe deeply interested in knowing what there was beyond. Their immense exploratory curiosity, the demographic growth of the bands generation after generation, and their flexible capacity of adaptation allowed them to colonize in just a few millennia every corner of the southern continent, from the high Andean punas down to the cold and windy channels of the south Atlantic. In time they adopted diverse ways of life. Some of them produced transcendental technological innovations such as pottery, metallurgy, monumental architecture, and astronomy. They also domesticated an great variety of plants, which after the sixteenth century, helped change the diet of the whole of humanity. Maize, tomatoes, potatoes, pumpkin, beans, cacao, peanuts, and many other vegetables were American products that have had an enormous impact on the nutrition of the whole world. This, among much else, was the legacy of those human beings from Asia all those thousands of years ago, who arrived to explore and inhabit a world that was wide and alien to them.

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# Chapter 8

## Cranial Morphology of Early South Americans: Implications for Understanding Human Dispersion into the New World

Mark Hubbe, Walter Neves, and Katerina Harvati

### 8.1 Introduction

During the last two decades, studies assessing the morphological affinities of early American crania have shown that crania dating to over 7,000 years BP generally show a distinct morphology from those observed in most later populations. This observation is better supported in South America, where larger samples of early specimens are available in population samples from central Brazil (Lagoa Santa; Neves and Hubbe 2005; Neves et al. 2007b) and Colombia (Bogotá Savannah; Neves et al. 2007a), as well as in isolated specimens from southeast Brazil (Capelinha; Neves et al. 2005), northeast Brazil (Toca dos Coqueiros; Hubbe et al. 2007), and southern Chile (Palli Aike; Neves et al. 1999). Distinct cranial morphology has also been observed in early skulls from Meso-America (Mexico; González-José et al. 2005) and North America (Jantz and Owsley 2001; Powell 2005). Furthermore, it has recently been demonstrated that the observed high levels of morphological diversity within the Americas cannot simply be attributed to bias resulting from the small available samples of early crania, as was previously suggested (Van Vark et al. 2003).

Recent Native American cranial morphology varies around a central tendency characterized by short and wide neurocrania, high and retracted faces, and high orbits and nasal apertures, although there is considerable variation around this central tendency (de Azevedo et al. 2011; González-José et al. 2003, 2008; Pucciarelli et al. 2008). In contrast, the early South and Meso-American crania tend to vary around a different morphology: long and narrow crania, low and projecting faces, and low orbits and nasal apertures (Hubbe et al. 2010, 2011; Neves and Hubbe 2005). As with the case of late Native Americans, early populations also show considerable variation around this central tendency, and their morphology overlaps to some extent with the morphology of late Native Americas.

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Although some authors defend that this overlap suggests there is not a clear differentiation between early and late groups in the continent (de Azevedo et al. 2011; González-José et al. 2008), when contrasted to modern worldwide variation, these differences are not subtle, being of roughly the same magnitude as the difference observed between East Asian and Australo-Melanesian populations, considered among the most morphologically distinct modern populations worldwide in terms of cranial morphology (Neves and Hubbe 2005; Neves et al. 2007a, b). When assessed within the comparative framework of worldwide craniometric human variation, early American groups show morphological affinities with some Australo-Melanesian and African samples, while most Amerindian groups share the morphological pattern observed today among recent East Asian populations (Neves and Hubbe 2005; Hubbe et al. 2010).

The existence of two distinct morphological patterns through time in the prehistory of the Americas has implications for our understanding of the settlement of the New World. Several studies of early American morphology have concluded that the differences observed between early and later American groups are too large to be accommodated into a single expansion event into the continent. Instead these works have argued for two dispersal events into the Americas by populations sharing a common ancestor in East Asia (González-José et al. 2005; Hubbe et al. 2010; Neves and Hubbe 2005; Neves et al. 2003, 2007a, b; see also Dixon 2001 for archaeological evidence in support of this idea). Others, however, consider that the morphological differences between early and late Native American populations result from differences accumulated through time in concert with local microevolutionary forces, such as genetic drift and natural selection, acting on cranial shape (Perez and Monteiro 2009; Powell 2005) or were a result of the continuous influx of diversity from Beringia into the continent (de Azevedo et al. 2011; González-José et al. 2008), an interpretation consistent with most, though not all, genetic evidence (Bonatto and Salzano 1997; Fagundes et al. 2008; Rothhammer and Dillehay 2009; Tamm et al. 2007; Wang et al. 2007; Zegura et al. 2004; but see Perego et al. 2009; Reich et al. 2012).

Consequently, the study of the origins of the morphological pattern of early Americans, as well as the process through which the morphological diversity seen in the continent through time originated, is key to understanding details about human dispersion into the New World in the past. Here, we summarize the results of our recent work on this subject (Hubbe et al. 2010, 2011), which show that: (1) early Americans share a similar morphological pattern of Late Pleistocene populations from the Old World (Europe and East Asia); and (2) that the differences observed between early and late American populations is greater than what would be expected by local micro-evolutionary processes, suggesting that the continent was settled through more than one dispersion wave from East Asia. Some of the results presented here (Hubbe et al. 2010) have been shown to be conditional on the comparative samples used to describe the morphological pattern of early Americans (Azevedo et al. 2011). Azevedo and colleagues defend a scenario previously proposed by González-José et al. (2008) of continuous influx of diversity into the Americas, based on analyses of Eskimo groups' morphological affinities. Although their analyses include more samples than ours, their results may be biased by arctic groups that show a later origin (Reich et al. 2012) and possibly morphological adaptations to cold environments (Hubbe et al. 2009). For these reasons, we do not believe their results can be used to rule out our own, nor can we dismiss theirs. Consequently, here we present our results and discuss them in a more cautious manner, assuming the continuous influx as a possible scenario as well to explain the origin of the observed biological diversity in the Americas.

## 8.2 Materials and Methods

The comparative samples included in this study comprise early American, European Upper Paleolithic, Late Pleistocene Asian, and recent modern human series (Table 8.1). The Early American series includes Late Pleistocene/Early Holocene samples from Lagoa Santa (Central Brazil; Neves and

**Table 8.1** Series included in the analysis and related information

Series/specimen		Geographic region/chronology	Sample size	Missing values replaced (%)	Chronology	References
Early humans	Mladec 1	European Upper Paleolithic	1	16.7	~31 kyr	Harvati (2009)
	Predmost 3	European Upper Paleolithic	1	0	Early upper Paleolithic	
	Predmost 4	European Upper Paleolithic	1	25.0	Early upper Paleolithic	
	Abri Pataud	European Upper Paleolithic	1	29.2	Early upper Paleolithic	
	Chancelade	European Upper Paleolithic	1	0	Late upper Paleolithic	
	CroMagnon 1	European Upper Paleolithic	1	4.2	27–28 kyr	
	CroMagnon 2	European Upper Paleolithic	1	29.2	27–28 kyr	
	DV13	European Upper Paleolithic	1	50.0	25–29 kyr	
	DV14	European Upper Paleolithic	1	0	25–29 kyr	
	DV15	European Upper Paleolithic	1	41.7	25–29 kyr	
	DV16	European Upper Paleolithic	1	45.8	25–29 kyr	
	DV3	European Upper Paleolithic	1	0	25–29 kyr	
	Grimaldi	European Upper Paleolithic	1	41.7	24–25 kyr	
	OhaloII	European Upper Paleolithic	1	20.8	19 kyr	
	Upper Cave	Late Pleistocene Asia	2	6.3	~30.0–11 kyr	
	Paleo Colombia	Paleoamerican	13	9.0	11–6.5 kyr	
	Lagoa Santa	Paleoamerican	19	17.3	11.0–7.5 kyr	
	Paleo Mexico	Paleoamerican	4	32.0	~10 kyr	
Modern humans	Base	America	16	13.0	~1.0 kyr	Neves and Hubbe (2005) Howells (1973, 1989)
	Tapera	America	48	11.8	~1.0 kyr	
	Arikara	America	69	–	Sub-recent	
	Peru	America	110	–	Sub-recent	
	Santa Cruz	America	102	–	Sub-recent	
	Dogon	Sub-Sahara Africa	99	–	Sub-recent	
	Teita	Sub-Sahara Africa	83	–	Sub-recent	
	Zulu	Sub-Sahara Africa	101	–	Sub-recent	
	Australia	Australo-Melanesia	101	–	Sub-recent	
	Tasmania	Australo-Melanesia	87	–	Sub-recent	
	Tolai	Australo-Melanesia	110	–	Sub-recent	
	Ainu	East Asia	86	–	Sub-recent	
	Buriat	East Asia	109	–	Sub-recent	
	Hainan	East Asia	83	–	Sub-recent	
	North Japan	East Asia	87	–	Sub-recent	
	South Japan	East Asia	91	–	Sub-recent	
	Berg	Europe	109	–	Sub-recent	
	Norse	Europe	110	–	Sub-recent	
	Zalavar	Europe	98	–	Sub-recent	
	Easter Island	Polynesia	86	–	Sub-recent	
	Mokapu	Polynesia	100	–	Sub-recent	
	Moriori	Polynesia	108	–	Sub-recent	

Hubbe 2005), paleo-Colombia (Savannah of Bogotá; Neves et al. 2007b), and paleo-Mexico (Central Mexico; González-José et al. 2005). The European Upper Paleolithic sample is composed of isolated Late Pleistocene individuals (Harvati 2009). The Late Pleistocene Asian series is composed of the two better preserved specimens from the Upper Cave, Zhoukoudian (UC-101 and UC-103; Cunningham

**Table 8.2** Craniometric variables included in the analysis

Variables <sup>a</sup>
Basion-nasion length (BNL)
Basion-bregma height (BBH)
Bistephanic breadth (STB)
Biasterionic breadth (ASB)
Nasion-prosthion height (NPH)
Nasal height (NLH)
Bijugal breadth (JUB)
Nasal breadth (NLB)
Bimaxillary breadth (ZMB)
Bifrontal breadth (FMB)
Interorbital breadth (DKB)
Malar length, inferior (IML)
Malar length, maximum (XML)
Foramen magnum length (FOL)
Frontal chord (FRC)
Parietal chord (PAC)
Occipital chord (OCC)
Nasion radius (NAR)
Subspinale radius (SSR)
Prosthion radius (PRR)
Dacryon radius (DKR)
Zygoorbitale radius (ZOR)
Frontomalare radius (FMR)
Zygomaxillare radius (ZMR)

<sup>a</sup>Nomenclature and definition after Howells (1973, 1989)

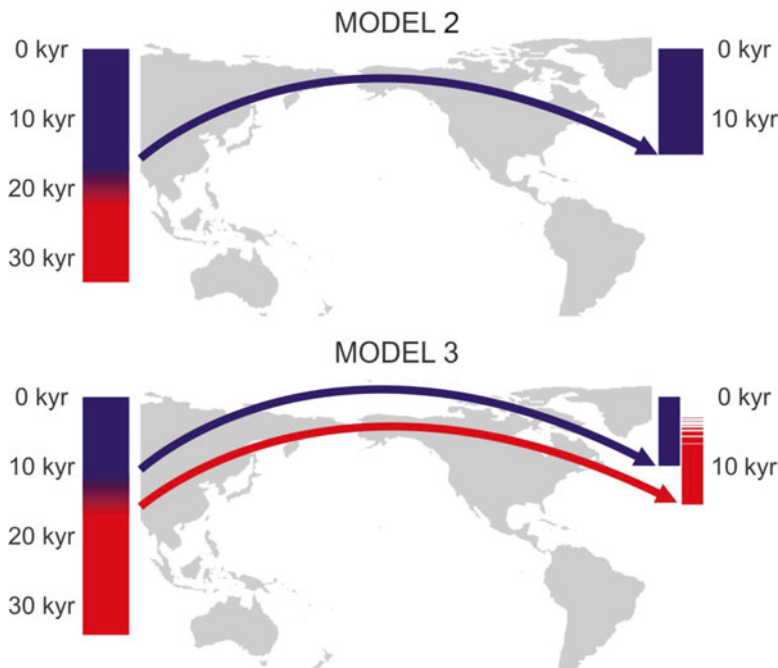
and Jantz 2003; Kamminga and Wright 1988; Harvati 2009; Howells 1996). Finally, 20 modern human samples from Howells’ database (Howells 1973, 1989, 1996) and two Late Holocene population samples from coastal southeast Brazil (Base and Tapera; Hubbe et al. 2010; Neves and Hubbe 2005) were included as modern reference series.

With the exception of the European Upper Paleolithic specimens, all series included here were measured following Howells’ protocol (1973, 1989). The Upper Cave specimens and the early American and Brazilian coastal series were measured by Neves, while the remaining modern human series were retrieved from Howells’ database (Howells 1996). The European Upper Paleolithic measurements included in this study were extracted from 3D landmarks collected by K. Harvati with a Microscribe MX digitizer. For comparison with the European Upper Paleolithic specimens, 24 of Howells’ linear dimensions (Table 8.2) were selected. For the tests of the best dispersion scenarios into the Americas, 19 neutral variables (not affected by climate factors) that did not show high percentages of missing values in the early series were selected from Howells database.

We present here the results reported in two of our recent publications (Hubbe et al. 2010, 2011). First, we analyze the morphological affinities between early Americans and Upper Paleolithic Europeans and Late Pleistocene Asians in relation to modern human cranial morphological variation. This was achieved through Canonical Variates Analysis (CVA) and Mahalanobis Squared Distances ( $D^2$ ; Mahalanobis 1936). Details on the methods and the rationale behind the tests can be found in Hubbe et al. (2011). In summary, CVA shows the morphological affinities based on the major axis of variation of the original data when the differences between the series are maximized (Van Vark and Schaafsma 1992), while  $D^2$  gives a measurement of dissimilarity among the series when all information available in the original variables is taken into account (Mahalanobis 1936). To visually present the affinities among the series,  $D^2$  values were used as the basis for a Minimum-Spanning Tree (MST; Gower and Ross 1969) that was superimposed on the morphospace expressed

by the first two canonical variates extracted. As a consequence, the results are presented in a graph that reveals two levels of morphological relationships among the series: one where only the two major axes of variation are observed (CVA) and the other where all of the variation seen in the original data is considered (MST based on  $D^2$ ).

The second set of analyses presented here was detailed in Hubbe et al. (2010). The goal of this set of analyses was to test (1) whether a dual dispersion model into the continent explains better the morphological differences seen across time than a single migration model; and (2) if the differences seen can be explained by neutral evolutionary processes (genetic drift) or if differences are too high for neutral processes to have generated them alone. For the first approach we created geographic distances matrices that represent three dispersion models (linear distances, single dispersion, and dual dispersion into the continent), following the methods detailed in Hubbe et al. (2010). The linear distance model is the control, where distances between each series were calculated directly, irrespective of geographic barriers, such as the Pacific Ocean. The single dispersion model assumes that all American series share only one common ancestor, i.e., the Americas' settlement was a result of only one dispersion wave at the end of the Pleistocene. Finally, the dual dispersion model assumes that early and late Americans share their last common ancestor outside the continent and thus the Americas were settled through two dispersion waves: the first one gave rise to the early morphological pattern and the second one brought the late morphological pattern and largely replaced the earlier population in the continent (Fig. 8.1). Each model was compared to the morphological distances observed between the series through Mantel matrix correlation tests (Mantel 1967) and Dow-Cheverud tests



**Fig. 8.1** Representation of the geographic dispersion models tested for the occupation of the Americas. Model 1 is not represented because it is a control model (assuming direct linear distances among all groups). The bars represent the morphological change observed in East Asia (*left*) and the Americas (*right*) during Late Pleistocene/Early Holocene. The *red* color represents the morphology present in Asia by the end of the Pleistocene and the *blue* color represents the morphology present nowadays in Asia and the Americas. Model 2 assumes that the morphological differentiation in East Asia occurred before America's settlement and that the New World was occupied only once; Model 3 assumes two distinct dispersions into the continent. See text for detailed description of each model. The dates presented are just approximations, but they assume America's settlement to have occurred around 15,000 BP

(Dow and Cheverud 1985), following the definitions presented elsewhere (Hubbe et al. 2010; Konigsberg 1997; Pinhasi and von Cramon-Taubadel 2009; Smouse and Long 1992; Waddle 1994). The comparison between models permits testing the goodness of fit of each one to the morphological data, and consequently allows us to test which contrasting model best explains the morphological diversity (Smouse and Long 1992).

For the second test, we calculated the rate of morphological differentiation between early and late Americans assuming three different scenarios: (1) early Americans are the direct ancestral populations of late Americans; (2) early and late Americans share a common ancestor by the time of the initial occupation of the continent (15,000 BP); and (3) their last common ancestor dates to 20,000 BP. Lynch (1988) reports the expected range of the rate of morphological differentiation under neutral expectation for mammals to fall between 0.01 and 0.0001, i.e., values above or below this range cannot be a result solely of neutral evolutionary processes. The methods of calculation and premises of the test are detailed in Hubbe et al. (2010) and will not be further explored here.

No specimens with more than 50 % of their variables missing were included in these analyses. Although 50 % is a high tolerance for missing values, this threshold is necessary to guarantee a minimum sample size for some of the early series. For all analyses, males and females were grouped together and size effect was adjusted by dividing each measurement by the geometric mean of the individual (Darroch and Mosimann 1985; Jungers et al. 1995). CVA was performed in Statistica 7 (Statsoft, Inc.) and Minimum Spanning Tree, Neighbor Joining Tree, and Mantel correlation tests were performed in NTSYSpC 2.10 t (Rohlf 1986/2000).

### 8.3 Results

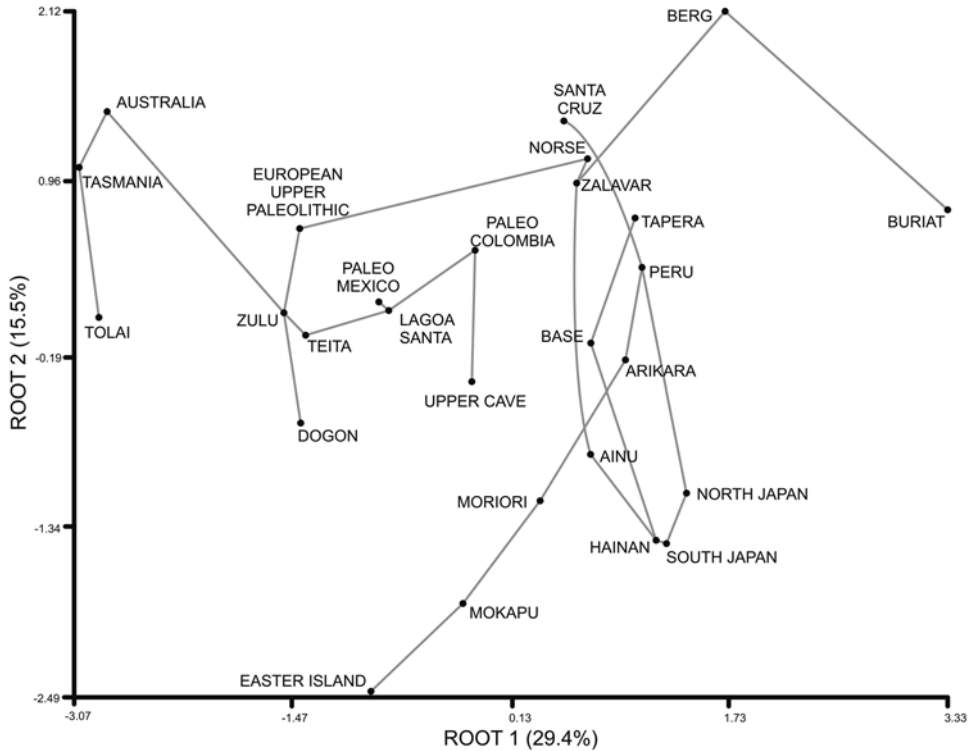
Figure 8.2 shows the comparison between early Americans, Late Pleistocene Asians, and Upper Paleolithic Europeans, when compared to the worldwide morphological variation. The distribution of the samples along the axes of the graphs represents their morphological affinities according to the first two canonical variates, while the lines connecting the series represent the Minimum Spanning Tree of the  $D^2$  matrix and represent, according to this statistic, the shortest path connecting all series. When only the canonical variate information is taken into account, it can be observed that, while recent samples present a general geographic logic, with series from the same region appearing closer to each other, all early samples appear closer to each other in the central region of the graph, in proximity to the sub-Saharan African series. As expected, late and recent Native American groups appear to be associated with East Asian populations in the first Canonical variate, as do some of the European samples (Norse and Zalavar). Furthermore, the MST connects all early samples to each other and to sub-Saharan Africa. No connection between early series and modern samples from their respective geographic regions can be observed, with the exception of European Upper Paleolithic and Norse.

Table 8.2 presents the Mantel test correlation results between the morphological distances and each of the geographic dispersion models. All correlations between geographic and morphological distances were highly significant. However, the correlation coefficients varied widely, indicating very different levels of support for each of the three models. As expected, the control model (linear distances) showed the lowest correlation coefficient. By far the highest correlation coefficient obtained was for the dual-dispersion model.

In order to test if this model presents a better statistical fit to the morphological distances than the other two models, Dow-Cheverud tests were applied. Table 8.3 presents the results of these tests, comparing the dual dispersion model against the other two models. As can be observed, the bipartite origin is clearly a stronger scenario than the control and one-migration models.

Figure 8.3 presents the mean rates of morphological differentiation calculated for all possible pairwise comparisons between early and late American series. The presented results must be





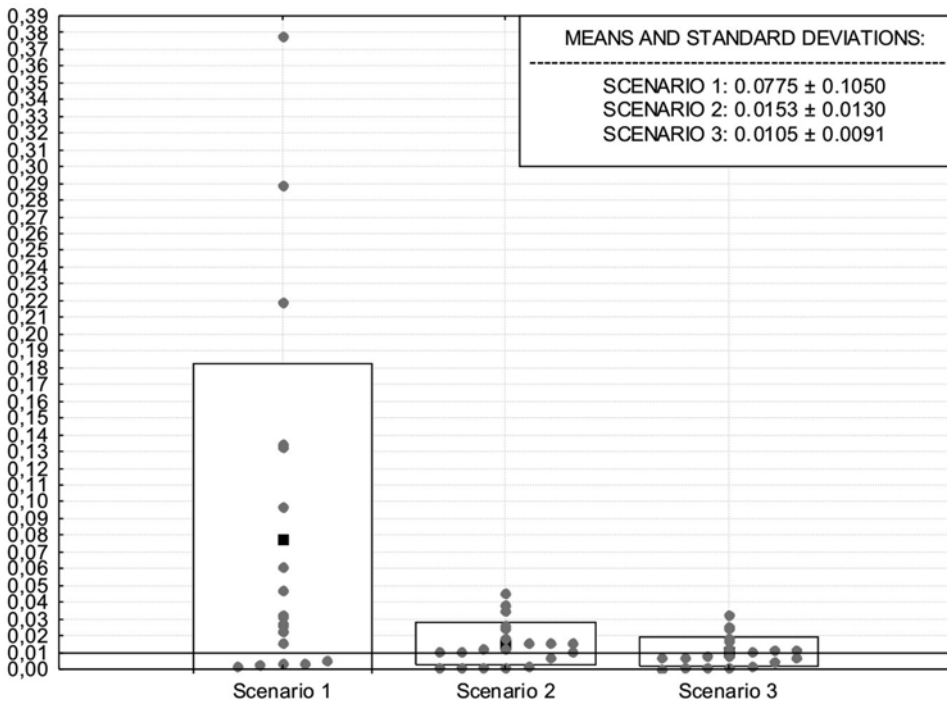
**Fig. 8.2** Morphological affinities of the series according to the first two Canonical Variates (*black dots*) and to the Minimum Spanning Tree (*gray lines*) of the Mahalanobis' Squared Distances between series

**Table 8.3** Mantel correlations between Mahalanobis Squared Distances ( $D^2$ ) and each of the geographic distance models tested

Dispersion model		$D^2$ calculated from 24 variables	$D^2$ calculated from 19 variables (without variables associated with climatic adaptation)
Model 1	Linear geographic distances (control)	$r=0.24545$	$r=0.22735$
		$r^2=0.06025$	$r^2=0.05169$
		$p=0.0018$	$p=0.0048$
Model 2	One migration through Beringia	$r=0.24827$	$r=0.25660$
		$r^2=0.06164$	$r^2=0.06584$
		$p=0.0117$	$p=0.0115$
Model 3	Two migrations through Beringia	$r=0.41192$	$r=0.47900$
		$r^2=0.16968$	$r^2=0.2294$
		$p=0.0004$	$p=0.0001$

$r$  two-way Mantel correlation  $r$ ,  $p$  associated probability of  $r$  after 10,000 permutations

interpreted in relation to the reported expected rate of morphological change for mammals under neutral evolutionary expectations, which ranges from 0.0001 to 0.01 (Lynch 1990). Accordingly, we show very high rates of morphological differentiation in general; in all scenarios a large part of the pairwise comparisons fall above the upper limit of the neutral expectation (0.01). The highest values in all cases are given by the comparison between Archaic Colombia and Peru, as a result of their high between-group variation. In the first scenario the mean rates range from 0.002 to 0.0378, with an average of 0.08. Clearly, these values refute the idea that late Native American morphology can be generated



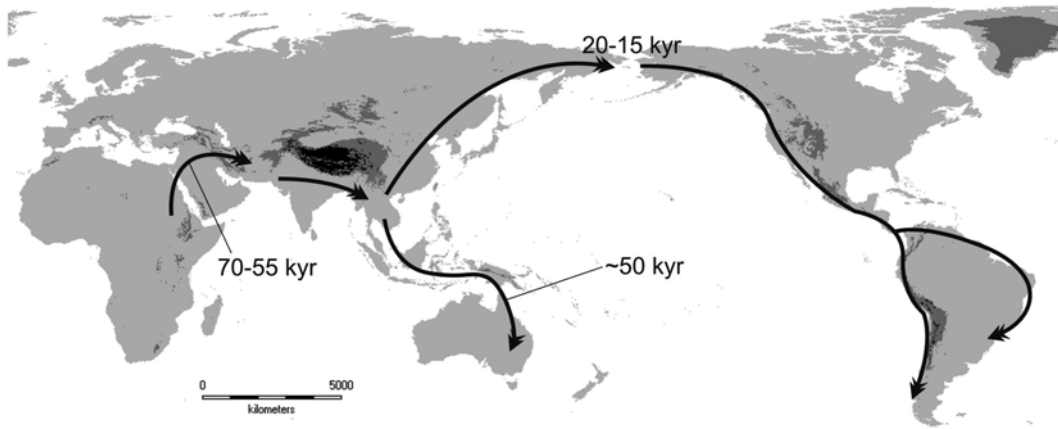
**Fig. 8.3** Boxplot of the pairwise mean rates of morphological differentiation (*gray dots*) calculated between early and late American series. The *black squares* represent the average of the pairwise mean rates for each scenario and the *rectangle* represents the confidence limit defined by one standard deviation above and below the mean rates. The *black horizontal line* shows the upper limit of the neutral expectation range (0.01)

through neutral evolutionary processes from the early American one. However, as the divergence time is increased (scenarios 2 and 3), the mean rates calculated approach the neutral limit of 0.01. Differences between the last two scenarios are too small to allow for any differentiation among them, but both scenarios favor the idea that the last common ancestors between early and late Americans antedates the arrival of the first human groups in the New World.

## 8.4 Discussion

Over the past few decades, there has been a growing consensus that all modern human groups shared a late common ancestor in Sub-Saharan Africa and, as a consequence, all Late Pleistocene/ Early Holocene groups derive from a single dispersion out of that continent. This idea is based on the fact that early modern humans, dating to the time period of the late modern human expansion (60,000–30,000 BP), tend to be more similar to each other than to later populations from the same region (e.g., Bräuer 1992; Grine et al. 2007; Harvati 2009; Harvati et al. 2007; Stringer 1992, 2002; Stringer and Andrews 1988).

In this context, the origin of early American morphology is a relevant question, especially given that it also differs from the morphology that is seen in contemporary East Asia, the region from which these groups most likely dispersed into the New World. The results presented here favor the idea of Neves and colleagues (2003; Fig. 8.4), who suggested that this morphology might be a retention of the



**Fig. 8.4** Following Neves et al. (2003), the morphology of early American groups might result from retention of the morphology of the first human groups, which left Africa between 70,000 and 55,000 BP. In this sense, the settlement of the New World can be seen as a direct extension of the human dispersion out of Africa into southeast Asia and Australia. Dates presented are an approximation based on the recent literature (Dillehay 2009; Mellars 2006; among others)

morphological pattern seen in the first modern humans leaving Africa, between 70,000 and 50,000 years ago (Harpending et al. 1998; Macaulay et al. 2005; Mellars 2006; Takasaka et al. 2006), and would thus precede the morphological differentiation in East Asian populations that likely occurred during the early Holocene. In this case, the first modern human expansion out of Africa into Asia, which likely followed a coastal route along South Asia (Lahr 1995; Mellars 2006), separated after reaching southeast Asia, with one branch expanding south into Australia and the other expanding north, towards Beringia, and subsequently into the Americas.

Retention of ancestral traits has also been observed in Late Pleistocene specimens from Africa (Grine et al. 2007), Europe (Harvati et al. 2007), East Asia (Harvati 2009; Neves and Pucciarelli 1998), and Australia (Schillacci 2008). A common undifferentiated morphological pattern across Eurasia in the Late Pleistocene is consistent with the predictions of the Single Origin Model of modern humans, favoring a common recent ancestor for Late Pleistocene groups around the Old World (Stringer and Andrews 1988).

Therefore, these studies broadly support the idea that the morphological diversity seen among modern human groups today is a process of late differentiation that probably took place during the Holocene. In this scenario, the closer morphological affinities observed between early Americans, European Upper Paleolithic, and Upper Cave samples presented here suggest that the largely undifferentiated Late Pleistocene modern human morphology also dispersed into the New World.

The fact that early American morphology might reflect a retention of the ancestral modern human morphology observed in the Late Pleistocene Old World has implications for our understanding of the settlement of the New World, especially if adaptation to cold climate is one of the forces responsible for the morphological differentiation in modern humans, even if only of specific anatomical regions (Harvati and Weaver 2006; Hubbe et al. 2009; Roseman 2004; von Cramon-Taubadel 2009). Since crossing the Bering Strait is believed to be the best route for early groups getting into the New World (Dillehay 2009; Dixon 2001; Goebel et al. 2008), this crossing through a harsh, cold environment must have been a relatively quick process, otherwise these populations would show evidence of cranial morphological adaptation to cold climate. The speed of this process, however, is hard to evaluate at the moment given that at present the duration of the processes of morphological adaptation and response to environmental factors is poorly understood.

This suggestion goes against molecular evidence, which has recently proposed a period of biological isolation of proto-American groups, possibly in Beringia, between 35 and 25,000 BP (Kitchen et al. 2008; González-José et al. 2008; Mulligan et al. 2008; Tamm et al. 2007; also see Chap. 4), although no major environmental or geographic barrier between Beringia and eastern Siberia existed to explain this isolation. Also, the idea of rapid migration following a coastal route has been proposed in recent years to explain the settlement of the New World (Dillehay 2009; Dixon 2001; Fagundes et al. 2008). It is reasonable to assume that the same pattern of dispersal was also adopted by earlier human groups prior to their arrival in the Americas (Mellars 2006). Therefore, it is possible that rapid coastal migration had already been adopted in Asia by Late Pleistocene humans groups for a relatively rapid crossing of the Bering Strait. In this context, coastal environments could represent quick range-expansion pathways, providing a relatively homogeneous ecological system for groups to spread without the necessity of significant technological innovations (but see Westley and Dix 2006, for a critique of the diachronic stability of coastal environments).

Regarding the processes of human dispersion into the continent, the second part of our results demonstrates that both chronological and geographical models assuming independent origins for these two populations via Beringia fit these morphological differences considerably better than the alternative models (Table 8.4). Under the assumption that morphological differentiation among modern humans during the Final Pleistocene and the Holocene was mainly a result of neutral microevolutionary processes (Harvati and Weaver 2006; Hubbe et al. 2009; Manica et al. 2007; Relethford 2004), the observed rates of morphological differentiation favor the idea that early and late American samples included in this study shared a last common ancestor outside the New World. At the same time, the geographic bipartite model resulted in a generally better fit to the morphological distances among groups.

Our results do not support the hypothesis that the morphological differences between early and late American groups are a result of in situ neutral evolution. Rather they fit better a two-wave dispersal model for the settlement of the New World. These results are again at odds with the majority of molecular evidence on Native American origins (Tamm et al. 2007; Wang et al. 2007; Zegura et al. 2004), although they agree with a recent study of rare mitochondrial haplogroups (Perego et al. 2009), which also favors two origins for early Americans associated with distinct crossings from northeast Asia within a short period of time (17,000–15,000 BP).

Recently, the two-dispersion model has been questioned by Azevedo et al. (2011), who showed that, by increasing the number of Native American populations in the analyses, the dual-dispersion scenario is not favored. Instead, they propose that the Americas were settled through a continuous influx of populations that brought the observed biological diversity into the continent. Although our analyses are limited in the number of American samples, Azevedo and colleagues (2011) postulate that the continuous influx of diversity from northeast Asia occurred largely in the northern extreme of North America, based on the morphological affinities of Eskimo populations with other American samples. However, it is difficult, for the reasons explored in their work as well as the biological relationship of Eskimos with other Native Americans (Reich et al. 2012), to refute our results or theirs. Yet, both models (two-dispersion and recurrent gene flow) assume that the morphological diversity observed in the Americas across time was not a result of local differentiation processes and depended

**Table 8.4** Results of the Dow-Cheverud test between the bipartite model (Model 3) against the other ones

		Dow-Cheverud results based on 24 variables	Dow-Cheverud results based on 19 variables
Model 3—Two migrations through Beringia versus			
Model 1	Linear geographic distances (Control)	$r=0.14537$	$r=0.21975$
		$p=0.0840$	$p=0.0143$
Model 2	One migration through Beringia	$r=0.16969$	$r=0.23062$
		$p=0.0656$	$p=0.0155$

*r* two-way Mantel correlation *r*, *p* associated probability of *r* after 10,000 permutations

on the input of diversity from Asia during the Holocene, and thus they favor the major conclusion of this chapter, i.e., that the Americas were occupied by multiple dispersion waves. Whether the influx of diversity was through discrete dispersion waves (as postulated by the dual-dispersion scenario) or through a continuous influx of diversity through Beringia (as defended by the recurrent gene flow model) remains to be properly tested.

The disparity between our results and those of most genetic studies points to a large gap in our understanding of the peopling of the New World. Our findings show that this disparity cannot be easily accommodated through climatic selection pressures and that local micro-evolutionary differentiation appears as a less probable explanation for the morphological differences between early and late Native American groups. We propose that the disparity might derive either from diverging sampling strategies between craniometric (that includes both extinct and extant series) and molecular studies (mainly restricted to extant groups); or from the fact that genetic quantitative traits such as cranial morphology might reflect different micro-evolutionary processes from those affecting autosomic or uniparental DNA markers. The first alternative has been proposed before (Neves et al. 2007b); however, recent efforts in recovering ancestral DNA from early Americans have failed so far in identifying distinct mitochondrial haplogroups in these samples (Gilbert et al. 2008; Kemp et al. 2007; Raff et al. 2011). The second alternative, on the other hand, has received some support based on the fact that parts of the skull morphology respond differentially to environmental pressures (Harvati and Weaver 2006; Hubbe et al. 2009; von Cramon-Taubadel 2009). Unfortunately, these possibilities cannot be satisfactorily evaluated until results derived from molecular and morphological data collected from the same populations (extinct and/or extant) are contrasted directly.

## 8.5 Conclusions

In conclusion, the comparative analysis of the morphological affinities of early South American groups suggests that:

1. The different morphological pattern presented among these populations is similar to the morphology that characterized modern humans before the Holocene. These analyses support previous studies (Grine et al. 2007; Harvati 2009; Harvati et al. 2007; Neves et al. 2003; Stringer 1992, 2002), suggesting that the morphological differentiation that characterizes modern human groups occurred long after the initial expansion of early modern humans (*Homo sapiens*) out of Africa. More importantly, our analyses favor the argument that this morphological differentiation occurred only after the first human expansion into the New World at the end of the Pleistocene.
2. The morphological diversity documented through time in the New World is best accounted for by a model postulating the entrance of further diversity into the continent after its initial occupation. At the present moment, it is not possible to clearly determine if this diversity was originated through two discrete waves of human expansion into the continent, as defended here, or if it is a result of a constant influx of diversity from northeast Asia through the Holocene, as defended by Azevedo and colleagues (2011). It is unlikely, though, that the observed morphological diversity in America is the result of diachronic trends of differentiation inside the continent.

With that framework in mind, our future work will focus on Middle Holocene populations in order to test the biological origin(s) of early South Americans, and how the initial occupation(s) of the continent gave rise to the actual continental biological and cultural diversity.

**Acknowledgments** We are grateful to André Strauss for allowing the usage of his VB code and to Phillip Gunz for helping with the transformation of the 3D landmarks into linear measurements. Christina Torres-Rouff kindly assisted with the English. This work was supported by FONDECYT (Project 11070091), the Max Planck Gesellschaft, the “EVAN” Marie Curie Research Training Network MRTN-CT-019564, FAPESP (Process 04/01321-6), and CNPq (Process 301126-04.6).

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# Chapter 9

## How America Was Colonized: Linguistic Evidence

Johanna Nichols

### 9.1 Introduction

America was colonized by Asian migrants who moved from northeastern Siberia into North America, either coastally or by an interior route through now-submerged Beringia, and from there spread southward eventually to settle in the entire hemisphere. That much is made clear by the geography, the human genetics, and the archaeological record. But much else remains unclear: when did immigration begin? how many genetic populations immigrated? how many linguistic populations? how fast did they move? Linguistic evidence can shed some light on these and other questions. It is not that we can reliably trace the languages of the Americas back to one or a few ancestral languages, reconstruct the vocabulary and grammar of the ancient ancestor(s), or show that the American languages are related to some Asian language family. Far from it; only rarely can a linguistic descent be traced back more than about 6,000 years, not even halfway back to the well-dated spread of the Clovis Culture across North America at about 13,000 BP.<sup>1</sup> Rather, the time required to generate the historically attested number of languages and language families in the Americas can be estimated; frequencies of structural properties in areally defined linguistic populations can discriminate between populations and point to geographic origins; and attested and straightforwardly reconstructable rates of language spread can be used to estimate rates of migration and demographic spread.

### 9.2 The Beginning of Asia–America Migrations

The archaeological evidence for the early colonization of the Americas is fairly straightforward. The earliest firm archaeological evidence includes a pre-Clovis mastodon hunting site at Manis, Washington, ca. 13,800 BP (Waters et al. 2011); a human coprolite from Paisley Caves, Oregon ca. 14,500–14,000 BP (Gilbert et al. 2008); human remains from Santa Rosa Island offshore from southern California, ca. 13,000 BP (Erlandson et al. 2011; Erlandson et al. 2008a, b:34); and an archaeological site including artifacts and human footprints and fingerprints in Monte Verde, Chile, ca. 14,100 BP (Dillehay 1997; Dillehay et al. 2008; Erlandson et al. 2008a, b); see also Gibbons (2014).

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<sup>1</sup> Here and below I express all dates in calendar years before present.

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In very recent work, Halligan (2014) describes an early find from Florida which Gibbons (2014) reports as dated to 14,500 BP. Human settlement of the Siberian Arctic began over 40,000 years ago (Hamilton and Buchanan 2010), but no firmly dated American site is anywhere near that old.

Recent estimates of the age of the American human population based on genetics generally range between 15,000 and 20,000 years (Perego et al. 2009; Schurr 2004; Tamm et al. 2007; and many others). A current view sees the American population as diverging from the rest of Asia beginning perhaps 30,000 years ago, followed by some 15,000 years of hunkering down during the Last Glacial Maximum (LGM) in Beringia, which recent work shows to have been a fairly rich environment for megafauna and humans at the time, followed by a rapid spread into the Americas ca. 15,000 BP (Hoffecker et al. 2014; Tamm et al. 2007; Willerslev et al. 2014).

For a summary of the different kinds of evidence as of 2004, see Madsen 2004 and especially Madsen’s recapitulation (389–396).

Entries to North America could have been by either interior or coastal routes, and recent work tends to assume that both occurred. The archaeologically based entry dates cited above are for interior over-land entries. Coastal colonization, by coastally adapted people using watercraft, could have begun early (Australia-New Guinea was settled before 50,000 BP, showing that seafaring technology existed very early), but any direct archaeological evidence has been obliterated by the postglacial sea-level rise. Colonization by coastally adapted people could certainly have begun by about 16,000 BP, by which time “the Pacific Rim was a plausible migration route, entirely at sea level, with rich and diverse resources from both marine and terrestrial ecosystems” (Erlandson and Braje 2011): a “Kelp highway” extended from Japan to Baja California (Erlandson et al. 2007), and southward to the Andean coast where rich estuaries created as the postglacial sea rise flooded coastal drainages (Erlandson and Braje 2011:29). The early North American sites listed above are coastal or near-coastal. Only in South America are there a number of inland sites with dates around 13,000 BP. For early coastal adaptation and coastal colonization in general, see Bicho et al. (2011).

9.3 Linguistic Evidence

The linguistic evidence, as interpreted, expanded, and reanalyzed over the last 25 years, continues to point rather clearly to a much earlier colonization and a much greater age for the American linguistic population. One form of evidence is the sheer number of distinct language families in the Americas. Table 9.1 gives the totals: the Americas contain close to half of the world’s language families.

This genealogical diversity has built up in two ways: immigration of distinct linguistic ancestors and diversification in situ. A language family generally takes about 6,000 years to become fully distinct from its sisters to the point that linguists can no longer demonstrate the common descent. Some language families are younger, e.g., the Chumashan family of coastal and near-coastal southern California, which, judging from the degree of its internal diversity and what can be inferred from the archaeological evidence, is not much older than the Romance or Germanic families (i.e., about

**Table 9.1** Total numbers of separate language families<sup>a</sup> by macrocontinent

Africa & Eurasia	87	(25 %)
Australasia	110	(32 %)
Americas	144	(42 %)

*Source:* The Autotyp database (Bickel and Nichols 2002ff; Nichols et al. 2013)  
<sup>a</sup>These are stocks in the technical sense of the Autotyp project (Nichols et al. 2013): the oldest genealogical level that is both demonstrably a family and reconstructable. There are a few older groupings that are demonstrably families, but too old to be reconstructable: the clearest case is Afroasiatic, comprising the stocks Semitic, Egyptian, Berber, Chadic, Cushitic, and Omotic

2,000–2,500 years). Some of these younger families may have older connections that are detectable but have not been detected yet; however, given the rates of extinction known to have accompanied language spreads over the last few thousand years, and the intensity of comparative work done in recent decades, it is more parsimonious to assume that these younger families are sole survivors of what would have been older families had their sisters survived.

Note that totals of languages and families are *extant* ones only, i.e., they represent successful colonizations. Some early archaeological sites could well be failed colonizations (Anderson and Gillam 2001:531), but if so they have not contributed to the attested linguistic diversity.

Rates of immigration from Asia to America are unknown, but given the rates of language movement and migration observable and reconstructable in the North Pacific region over the last several thousand years, entries are unlikely to have occurred more often than one every two or three millennia. (For the prehistory and reconstruction of the two North Pacific families, Eskimo-Aleut and Chukchi-Kamchatkan, see Fortescue et al. 1994 and Fortescue 2005.) Overland immigration into North America was probably impossible during the LGM and infrequent until the deglaciated corridor between the cordilleran and continental ice sheets had been colonized by enough plants and animals to enable a pedestrian society to survive enroute from central Alaska to northern Oregon.<sup>2</sup> Also, importantly, the ecology and resources of the passage had to be sufficient to support a spread or motivate a migration in the first place.<sup>3</sup>

A language occasionally diversifies into a large number of surviving daughter branches, giving rise to an old family with many initial branches, but this is not common. When it does occur, it usually accompanies unusual and archaeologically detectable situations such as major economic or technical advances or recolonization of mostly empty lands after a major drought or a glaciation. Rates of diversification and/or change that would create large numbers of families in substantially less than 6,000 years could conceivably have accompanied the initial spread of modern humans (*Homo sapiens*) into previously uninhabited lands and, therefore, might have accompanied the frontier of the human spread into and across the Americas, but it is difficult to believe that such processes would not also have been visible in the Austronesian colonization of the remote Pacific or the Pama-Nyungan expansion across interior Australia (Austronesian: Blust 2009; Donohue and Denham 2012; Kirch 2010; Ross et al. 2008; and Pama-Nyungan: Bowern and Koch 2004 and McConvell 1996). Nichols (2000) assumed a frontier with rapid diversification and multiple colonizations at relatively rapid rates, but was still unable to reach a postglacial initial colonization without violating uniformitarianism. To summarize, the genealogical diversity of the American linguistic population demands an earlier beginning of the colonization process than either the archaeological or the genetic evidence appears to provide.

Once in North America, how rapidly did human societies spread southward and eastward to populate the entire hemisphere? We have a few examples of archaeologically traceable expansions into new lands. The settlement of the Siberian north beginning ca. 46,000 BP moved at about 0.25 km/year, with a halt and stasis from ca. 32,000 to 16,000 BP, then movement into the Americas at about 1 km/year (Hamilton and Buchanan 2010). The Paleolithic recolonization of the Levant and Europe proceeded at about 0.4–0.8 km/year (Fort et al. 2004). The Pama-Nyungan spread to recolonize the interior of Australia after a millennia-long drought moved just under 4,000 km in about 5,000 years for an average rate of 0.77 km/year (McConvell 1996; rate calculation Nichols 2008). The early stage of the Algonquian spread across North America probably involved an expansion from the vicinity of the Snake River in western Idaho as the Altithermal period peaked on the Columbia Plateau and began to ameliorate on the Great Plains, to the upper Mississippi and west of Lake Superior (Hill 2004, drawing on Denny 1991), about 1,900 km in about 1,700 years, so about 1.1 km/year. Otherwise, we have evidence only from spreads of new technologies or archaeological horizons through already

<sup>2</sup>This could have occurred as soon as the corridor supported enough insect and plant life to function as a flyway for migratory waterfowl.

<sup>3</sup>See Note 2: migrations of birds would have signaled to hunters that the flyway led to life-supporting terrain.

inhabited land. The most studied and most modeled of these is the spread of the Neolithic across Europe, for which various models yield rates from about 0.7 to about 1.1 km/year (Fort 2007). Thus, any overland colonization and spread is unlikely to have proceeded faster than about 1 km/year.

Unfortunately, we have no firm archaeological evidence for rates of coastal spread in initial colonization, chiefly because the postglacial sea-level rise has obliterated archaeological evidence for the settlement of most of the inhabited world. The Polynesian colonization of the Pacific, if measured only during its peak migration period, proceeded rapidly, about 9 km/year (Nichols 2008 for the calculation, sources referenced there for the dates), but the early Polynesians were horticulturalists who could produce and store food for long sea journeys, they used sailing technology unavailable during the Paleolithic, and in any case long-distance open-ocean island colonizations are not a good model for coastal movement by coastal specialists.

Here is where linguistic evidence can be useful. Spread rates can be calculated for every language family whose geographical range is known (all modern language families and some ancient ones) and whose age can be measured or estimated. We have very good datability wherever there is inscriptional attestation of ancient languages (such as Latin, Vedic Sanskrit, and Archaic Chinese, ancestral respectively to the Romance, Indic, and Chinese families) or archaeological evidence (as for Indo-European, firmly datable to the western Eurasian steppe at about 6,000 BP: Anthony 2007; Chang et al. 2015; Darden 2001). For the vast majority of the world's ca. 350 language families, dating is much less precise, relying on computational methods whose accuracy is improving but suboptimal, estimates that assume regular rates of vocabulary loss when that is known to be variable, and comparisons of levels of diversity (grammatical, lexical, etc.) to those of more firmly dated families. It needs to be emphasized, though, that while such dates are quite approximate, they can probably be assumed to lie within a millennium of the actual date; there is really no mistaking a family of Romance-like divergence (Romance is about 2,000 years old) for a family of Indo-Iranian-like divergence (about 4,000 years) or Indo-European-like divergence (6,000 years).

A language family's rate of spread is then the diameter of the language's range at its widest, divided by its (approximate) age (Nichols 2008). This measure is only approximate, not only because language family ages are often approximate, but also because attested ranges of families may have retracted from former maxima or expanded due to post-colonial events that have no analog in earlier times. Increasingly though, historical and linguistic research are able to identify even these confounding factors. Furthermore, rates need not be measured precisely in order to test hypotheses about the first colonization of the Americas. Recall that the linguistic evidence generally points to a considerably earlier colonization than the archaeological, genetic, and paleoclimatological evidence indicates. The null hypothesis is then that colonization was not earlier than the time frame of the convergence of those three sciences, and the question is whether that null hypothesis can be falsified. Therefore, where migration rates are concerned, we only need to show that even the fastest plausible spread rates could not have brought people starting from the southern edge of the ice sheets post-LGM to Monte Verde, Chile, by 14,100 BP.<sup>4</sup> This means that the fastest migration and spread rates, even if unsustainably fast or unrealistically fast for the environment, are conservative because, by shortening the migration time, they favor the null hypothesis.

These measures are valuable because language families are numerous, so spread rates can be averaged and compared across a number of variables (Nichols 2008). Rates prove to be systematically sensitive to geography: they are faster at high latitudes, in continental interiors, and in dry or seasonal climates than at low latitudes, near coasts, and in subtropical and tropical climates. They are not particularly sensitive to the difference between foraging and food-producing economies. They are of course quite sensitive to modes of transport, so that spreads using horses, wheeled vehicles, or ocean sailcraft cluster among the fastest spread rates. It appears that spreads involving language shift move somewhat

<sup>4</sup> The distance can be walked, of course, in a few years. At issue here is not human walking speed but rates of migration and ethnic spread.



faster than those involving demographic replacement or spread, and migrations move faster than demographic expansions. Spreads do not move at constant rates; whenever there is evidence, they prove to have short bursts of peak movement followed or interspersed by pauses, and comparisons of other factors need to take this into account. The fastest spreads involve beeline migrations along established routes and/or to known destinations. For these various reasons, the fastest spread tabulated there is that of the Lapita archaeological horizon across Oceania at 20 km/year, either carrying or accompanying the spread of the Oceanic subbranch of Austronesian across island Melanesia (Donohue and Denham 2012; Kirch 1997, 2000, 2010): it was a spread of food producers using advanced ocean voyaging technology and spreading by beelines through an established voyaging and trading network, and it is the short-term peak spread rather than the entire history of the Lapita culture and the Oceanic subbranch of Austronesian.<sup>5</sup> This spread is obviously not an appropriate model for the coastal settlement of the Americas.

The fastest of the plausible spread rates applicable to the colonization of the Americas is that for Pacific Coast Athabaskan (British Columbia to northern California in 400–700 years, depending on interpretations of the archaeology), from 2.9 to 5 km/year (near-coastal),<sup>6</sup> or the Numic spread through the Great Basin (2 km/year, interior), for the higher latitudes; and the southward spread of Pama-Nyungan in eastern Australia (0.68 km/year; coastal) or the eastward spread of Western Desert in central Australia (1.6 km/year; interior). At these rates, moving from the lower Columbia (where the glaciers ended) to Monte Verde would require a start date well before 20,000 BP and probably before 25,000 BP. These rates are the carefully cherry-picked fastest ones in order to favor the null hypothesis, and the distance is calculated from just south of the ice sheets in order to bypass the thorny question of how people entered North America during glaciation in the first place. Despite this support they easily falsify the null hypothesis.

It is conceivable that all of the ages given for language families are systematically too old, so that movement has actually been faster than calculated here—though it is highly unlikely that the various dates, estimated using various means by different linguists, would all error in the same direction. It is also conceivable that all the language-family diameters systematically underestimate the actual greatest range achieved in the family's spread (e.g., by undetected loss of territory to neighboring language families, though those families are usually also measured here)—but (again in order to favor the null hypothesis) diameters have been measured from edge to edge when spreads have rarely begun at the very edge of a range, so the rates are artificially fast in the first place. It is more plausible, though still unlikely, that initial colonization rates were systematically, and substantially, faster than the rates calculated from extant language families—though as noted above spreads by expansion, or into previously unoccupied land, generally appear to have been slower than spreads by language shift, the main driver of language spreads in already inhabited land. It is also worth emphasizing that no spread could have been sustainable if it had moved the frontier faster than the expanding society could fill the range at least to the extent of making it possible for small migrating groups at the frontier to find marriage partners for their younger generations, as this generally requires access to a total population of at least about 500 individuals (Moore 2001, 1987).

To summarize, the linguistic evidence consistently yields rates of diversification and spread that clearly imply a much greater age for the American population than the genetic, archaeological, and

<sup>5</sup> Another apparent sprint is the rapid spread of Clovis fluted points across much of North America in some 200 years, a rate of about 24 km/year (Anderson et al. 2005; Waters and Stafford 2007), but in view of its antiquity and the inherent nature of the archaeological record it is likely that sites from both the earliest and latest ends of its spurt are still to be found. In any event the Clovis culture cannot be connected to any language family, so it cannot be compared to the linguistically based rates used here. Hamilton and Buchanan (2010) give an overall spread rate of 7.6 km/year for the entire Clovis spread.

<sup>6</sup> This was a series of beeline migrations to known destinations: “Moving in small raiding parties, ... followed the Columbia River across the Plateau and through the Cascades to the Pacific” [southward along either the Cascades or the coast] (Golla 2011:257–258). The other rates cited in this paragraph are from Nichols (2008).

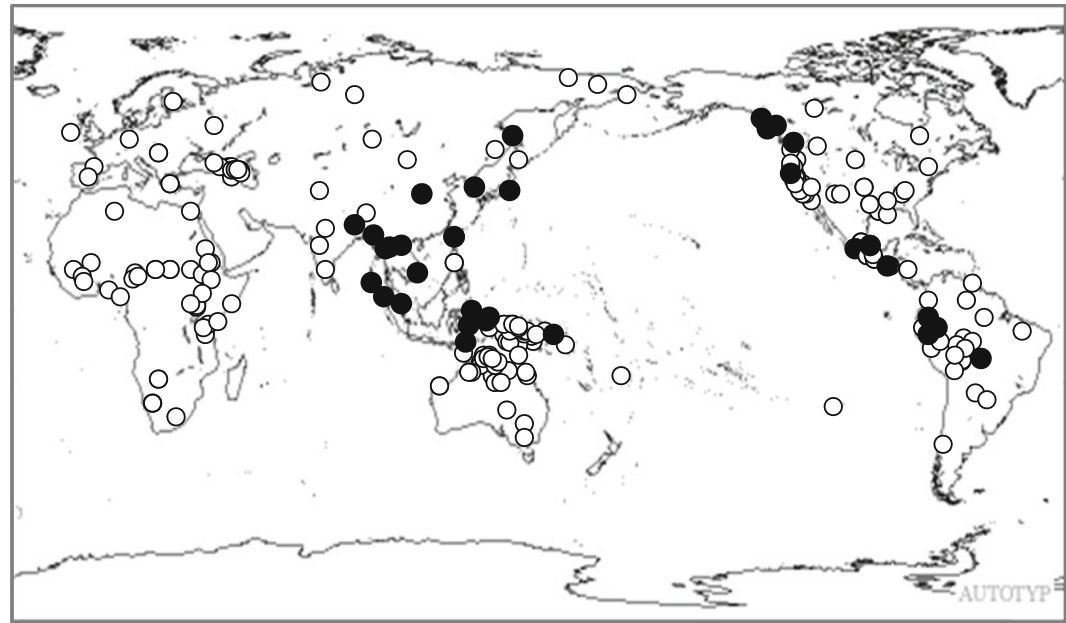
paleoclimatological evidence suggests. The main unknowns arise in connection with initial coastal colonization, rates of Pleistocene coastal spread, and frequencies of high-latitude coastal spreads. Archaeological information that is straightforwardly obtainable on land, such as site densities and high-latitude technology, will probably never be available for glacial-age coastal societies because the postglacial sea-level rise has generally obliterated the sites. Still, recent growth of interest in comparative cross-cultural study of ancient maritime adaptations (Bicho et al. 2011) and a handful of recently undertaken underwater archaeological surveys (Bicho et al. 2011, especially the editors' Preface) give hope that more will soon be known. Simulation and modeling can compensate for data gaps: Bulbeck 2007 models the human spread from Africa to Sahul as a rapid patchwise spread from estuary to estuary by people capable of paddling and storing water. The rates he mentions range from 0.7 km/year, comparable to the linguistically and archaeologically derived rates for various spreads mentioned above, to 4 km/year, a rapid rate, suggesting that at least some of the coastal spread could have been fairly rapid, especially that between southern California and central Chile, where estuaries are the rich spots on an otherwise fairly dry coast. Recall from above, though, that a still faster rate of spread for the entire distance from the lower Columbia to central Chile is required to settle Monte Verde from a post-LGM start by its attested time. For now we are left with a mystery: linguistic evidence of several types demands much earlier dates for the first settlement of the Americas than other relevant sciences do. The linguistic evidence is plentiful enough and rigorously enough compiled and analyzed that it cannot simply be dismissed.

## 9.4 Linguistic Population Structure in the Americas

The evidence reviewed above suggests that, in the early stages of colonization, societies remained primarily coastal and spreads and migrations must have moved southward along the coast, with occasional movements into near-coastal environments. The terrestrial archaeological record shows only the sites that were far enough inland to be above the present shoreline, which must be a small sample of the total and not from the very earliest landfalls, but from after enough time had passed to enable the coastal settlers to familiarize themselves with inland resources and forage well inland. Monte Verde, Chile, is 15 km from the nearest estuary environment and 90 km from the coast (Dillehay et al. 2008; Erlandson et al. 2008a, b) and has both seaweed and inland plant remains, implying that coastally oriented people were foraging inland and/or that trade had developed between inland and coastal peoples.

In view of the generally high linguistic and cultural diversity of Pacific coast populations, there is likely to have been a continuous stream of occasional coastal immigrants resulting from predominantly counterclockwise gradual movement around the Pacific Rim from perhaps as far south as Southeast Asia and ultimately reaching Tierra del Fuego. Inland immigration from Beringia began somewhat later and/or involved fewer immigrations and a less dense population until 13,000 BP when Clovis points appear rapidly in numerous sites across interior North America. Clovis technology appears to be that of inland big-game hunters, and it is not known whether it reflects an overland immigration from Beringia or an offshoot of a society ultimately spread from the coast.

At some point the coastal immigrant stream was entered by a distinct linguistic population (perhaps a single language or family, perhaps a set of unrelated representatives of a grammatically definable language area). This happened after colonization was well underway, but much earlier than the traceable age of any demonstrated language family. This new population brought to the American Pacific Rim a number of structural properties found with observable frequency around most or all of the Pacific Rim linguistic area including Oceania and New Guinea: numeral classifiers (Bickel and Nichols 2006), elaborate possessive classification (Nichols and Bickel 2011), personal pronoun systems with first person *n* and second person *m* (Nichols and Peterson 1996, 2011), verb-initial basic



**Fig. 9.1** Languages with numeral classifiers ( $N=211$ ). *Open circle* No numeral classifiers, *filled circle* Numeral classifiers

word order, large consonant inventories, and a number of others (Bickel and Nichols 2006).<sup>7</sup> There are no corresponding grammatical traits characteristic of only the inland American languages; such prototypically American traits as head-marking morphosyntax, its concomitants noun incorporation (Caballero et al. 2008) and polysynthesis, verb-based derivational morphology, and others are found in both the Pacific Rim population and the interior.

Figure 9.1 shows one of the Pacific Rim traits, numeral classifiers, in a worldwide genealogically and geographically distributed sample of languages from the Autotyp database (Bickel and Nichols 2002ff). Numeral classifiers are grammatical morphemes that are obligatory in noun phrases with a numeral, and which reflect one or more properties of the quantified noun. They are well known to be common in Asian languages, e.g., these Mandarin examples (Norman 1988:157; Ramsey 1987:68; classifiers boldface; in the interlinear, CL = general classifier, STRIP and VOLUME are quick glosses of classifiers reflecting the shape of the counted noun):

<i>yí-<b>ge</b> rén</i>	<i>yì-<b>tiáo</b> hé</i>
1-CL man	1-STRIP river
“one man”	“one river”
<i>liáng-<b>ge</b> rén</i>	<i>liáng-<b>ben</b> shu</i>
2-CL person	2-VOLUME book
“two people”	“two books”

<sup>7</sup> Bickel and Nichols (2006) use a geographically based definition of the Pacific Rim area: from Pacific (or Pacific-facing) coast and offshore islands inland up to the far side of the major coast range. Pacific Rim traits are those found with significantly higher frequency in the Pacific Rim population than in the adjacent geographical areas (such as intermontane North America, lowland South America, interior and southern New Guinea). See also Nichols et al. (2013). In this approach the definition of the area and the identification of structural properties typical of it are entirely separate.

They are common not only in Asia, but also in Pacific-facing coastal regions of Melanesia and the American Pacific coastal region.<sup>8</sup>

We thus have an asymmetrically overlapping American linguistic population with a discernable Pacific Rim population, but no distinctive hallmarks of the rest of the languages. Language families have the same sort of distribution: some originally coastal or near-coastal families have substantial inland extensions, such as the Salishan family, originally coastal but now extending well into the intermontane region, and the Algic family, whose western branch, Algonquian, extends from the Great Plains to the Atlantic coast. If the interpretation given above of the distribution of early North American archaeological sites is correct, the same was true of the human population in the early stages of colonization: some coastal societies foraged well inland, so that much of the early inland population may well derive from the coast but not vice versa. Thus, the overlapping distribution and asymmetrical discreteness of the Pacific Rim and other linguistic populations may partly reflect differential composition of the north Siberian and Beringian population versus the Asian coastal population, but if so the reflection is not straightforward. It is interesting that the coastal population (linguistic and archaeological) appears to have had more input into the interior population than vice versa.

Thus, from the linguistic standpoint, Asia-to-America migrations began very early—earlier than either archaeological or genetic evidence suggests—and early settlement was probably primarily coastal. By the time today's linguistically detectable language families had come into existence, the Pacific Rim and interior/Atlantic linguistic populations had become different to some extent though with overlap. That difference reflects processes of population formation and areal spread in the long-colonized Americas, though in some respects it may also derive from differences between the Asian coastal and Beringian linguistic populations of the Pleistocene. Structural grammatical properties, at least those most prone to be stably inherited, in detectable frequencies may be traceable somewhat farther back than language families, but they too change and dissipate over time, so it is quite unlikely that the typological profile of the American Pacific Rim linguistic population, or the American population overall, is now faithful to any Asian structural profile of the time frame of initial colonization seen in the genetic and archaeological evidence, much less the older time frame implied by the linguistic evidence.<sup>9</sup>

**Acknowledgments** I thank the Embassy of Kazakhstan, the Permanent Delegation of Kazakhstan to UNESCO, and the Harriman Institute (Columbia University) for making possible the second Great Migrations conference, which among other boons suggested some of the new lines of thought in this work. The research reported here was supported in part by the NSF and the Max Planck Institute for Evolutionary Anthropology, Leipzig; support for the Autotyp database has additionally been provided by the Committee on Research of the University of California, Berkeley, the University of Leipzig, and the University of Zürich.

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<sup>8</sup> A few tokens can be expected by chance in any continent: Gil (2011) surveys Africa more densely and finds three tokens, but they have no particular geography. He also includes optional classifiers, which increases the density of attestation in the Pacific Rim and expands the area in the directions of its expansion and migrations from it. In Eurasia, many Turkic languages have optional classifiers; ancestral Turkic originated in the vicinity of Manchuria (Janhunen 1996:216), i.e., in or near the Pacific Rim area, and the trait must reflect that origin.

<sup>9</sup> Bickel (2013) and Nichols (2010) on different grounds find that even the most stable structural properties are unlikely to last in detectable frequencies as long as 20,000 years. One or another trait might survive much longer in one or another language, but frequencies among that language's sisters or neighbors are very unlikely to exceed chance, making it impossible to detect ancient families or ancient areas on the strength of just structural typological properties.

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# Chapter 10

## Kinship, Demography, and Paleoindian Modes of Colonization: Some Western Canadian Perspectives

John W. (Jack) Ives

### 10.1 Kinship, Anthropology, and Paleoindian Studies

Unlike many avenues of social science enquiry, the study of variability in human kinship has been almost uniquely the domain of anthropologists. Kinship provided core subject matter for more than a century of anthropological thought (Trautmann 2001), and until quite recently, important theoretical trends in anthropology were founded with significant reference to kinship studies. Despite its centrality as anthropological subject matter, detecting organizing features connected with kinship in archaeological records or using kin structures in understanding the past have been subsidiary activities in anthropological archaeology.

This in part explains why, when social organization in Paleolithic or Paleoindian contexts is considered, kinship rarely makes an appearance: when it does, it is in rather nebulous form and of limited explanatory power. These applications include reference to kinship in realms such as “non-utilitarian interaction,” hexagonal packing and information networks, sex and subsistence, or even “sex and the single colonizer” (MacDonald 1998; Meltzer 2009; Whallon 2006; Wobst 1974). The emphasis is consistently upon the biological nature of human *mating* and seldom upon the kin-structured patterns of marriage invariably associated with culturally modern human societies. These usages fail to take into account the gravity that First Nations elders attach to successful marriages. In other instances of demographic modelling, kinship is treated at a high level of generality, but with some highly specific and at times unwarranted assumptions based on cross-cultural generalizations.

### 10.2 Modalities in Hunter-Gatherer Group Sizes

Kinship in deeper prehistoric contexts might well be regarded as open only to “data free” interpretation, but such perceptions have hindered significant lines of enquiry that can provide novel insights into the Paleoindian phenomenon. Hunter-gatherer or band societies require holistic, integrated solutions to the socioeconomic reproduction of their societies through elapsing generations. The *Man the Hunter* generation of research articulated an empirical basis for “magic numbers” of roughly 25 and 500 in band societies. Many anthropologists have accepted the value of a “microband–macroband”

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dichotomy (or variants thereof) in helping us to understand hunter-gatherer socioeconomic organization in a wide variety of circumstances (e.g., Anderson and Gillam 2000; Binford 2001; Wobst 1974). One might even argue, as Whallon (1989, 2006) intimated, that it was precisely this socioeconomic structuring that allowed culturally and anatomically modern human populations to enter and thrive in the world's most severe environments, where earlier hominins could not.

Yet, when we consider terminal Pleistocene conditions, it is invariably the economic dimension of microband activities that we assess, often with extremely detailed models based upon evolutionary ecological precepts about how they forage. This is but one of two pivotal dimensions of the microband–macroband distinction. That other dimension concerns the fashion in which microbands must have access to the macroband, a larger entity sometimes referred to as the “regional marriage isolate” in hunter-gatherer literature.

Several simulation studies have concluded that the small population sizes typical of microbands are highly susceptible to stochastic variability in birth events: model results indicate that group sizes in the range of 25–50 persons generally do not persist beyond two to three centuries at best, and usually far less (Ammerman 1975; Anderson and Gillam 2000; Moore 2001; Weiss 1973; Wobst 1974). Consequently, microbands require access to an entity the size of the macroband: the several hundred individuals in the macroband are far less susceptible to these purely stochastic effects. The microband is the hunter-gatherer entity that manages economic needs throughout the majority of a year; the macroband exists in a demographic range that more readily allows for the persistence of a regional population.

This much many might agree with, but it is precisely in this area that some critical assumptions about kinship started to be made. Moore (2001), for example, described the “marriage problem” in his modeling exercise for human colonization as one in which small scale societies “almost universally avoid marrying or mating with siblings, parents, siblings of parents, first cousins, and grandparents.” Small, initial populations rapidly become too closely interrelated for marriages to occur. He drew specific reference to Cheyenne kinship, where all relatives of ego's generation are referred to as siblings (Eggan 1955a). Here Moore makes an assumption with demographic implications that then colors his entire approach to the colonization of the New World (Moore and Moseley 2001). This assumption is very much open to challenge; it is generally thought that the antecedent Algonquian kin system (perhaps extant in the mid-Holocene) is indicative of a situation in which cross-cousin marriage likely did occur, and a number of other Algonquian groups are known to have practiced cross-cousin marriage, if we are thinking of prototypes (see also Anderson and Gillam 2001; Eggan 1955a, b; Ives 1998; Wheeler 1982). Simply specifying a single, universal kin condition with these impacts is not realistic given the ethnographic range of alternatives known to be available.

In the larger course of hunter-gatherer studies, the empirical foundation we have outlined generally led toward approaches that investigated how forager bands were maintained or regulated—essentially asking how they stayed the same. When we transport this manner of thinking to the realm of colonization and migration, we see only that hunter-gatherer groups may from time to time fission, as an uncomplicated by-product of population growth. Yet, nowhere could such fissioning processes be more critical than in colonization circumstances. To understand the *intergenerational* lifespan of microbands and macrobands and the ways in which fissioning may occur, there is an altogether different question we need to ask—how do hunter-gatherer bands form in the first place?

### 10.3 Constructing a Thought Model Informed by Kinship

Colonization and migration processes are exceedingly complex historical phenomena, and it is essential that in constructing quantitative models, we begin with realistic premises (e.g., Anthony 1990, 1997, 2007; Rockman and Steele 2003). I propose that before we attempt to model these processes in

quantitative terms, it is critical that we invest time and effort in viable “thought models” solidly grounded in one of the more salient features of human cultural life, kin systems.

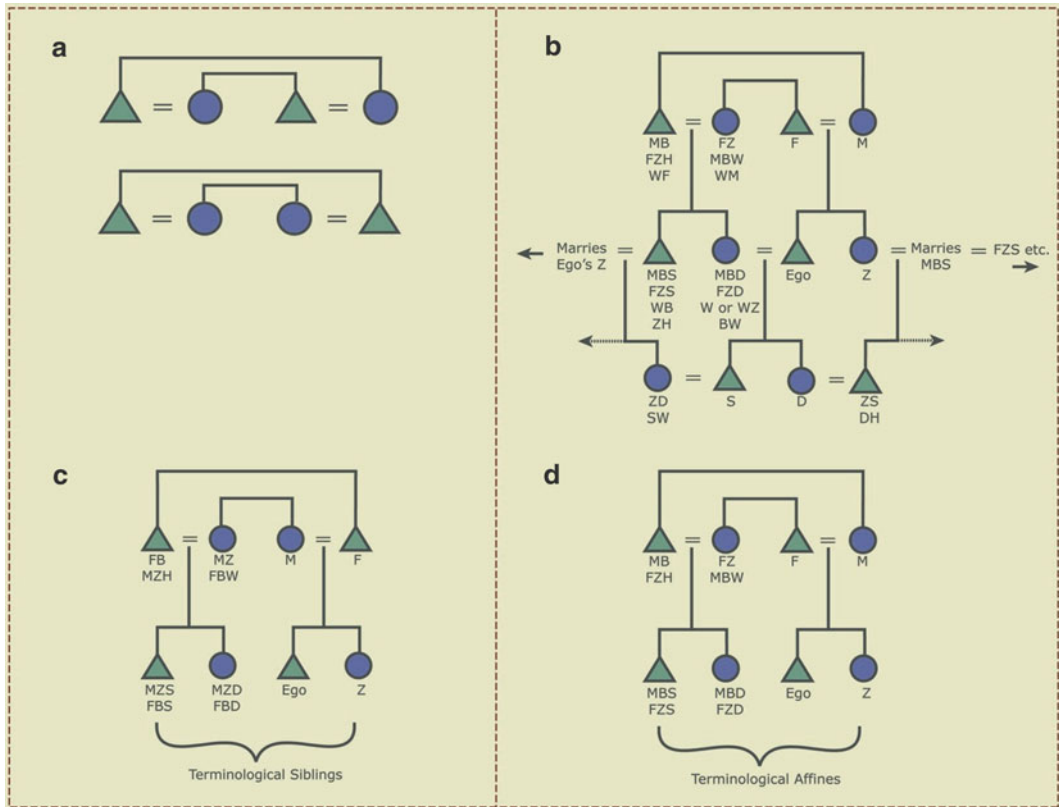
Phenomenally successful though the early settlement of the New World turned out to be, we do need to acknowledge the “degree of difficulty” connected with the initial processes. The Beringian world can be conceived of as the northeastern periphery of the entire hominin world in late Pleistocene times, and there is no evidence that it was successfully settled prior to the advent of anatomically and culturally modern humans (*Homo sapiens* ssp. *sapiens*). Eastern Beringia (i.e., largely unglaciated Alaska, the Yukon, and adjacent continental shelves) would form a large cul-de-sac at the unsettled terminus of this world. The environmental realities present in this region undoubtedly meant that low-density terminal Pleistocene human populations on or near the Bering platform overcame truly formidable colonization challenges.

To progress into the Americas, such populations would need to contend with either or both of two difficult environmental settings—the cold, open environments of the expansive Beringian platform and eastern Beringia (eventually extending toward the deglaciating “Ice Free” Corridor of western Canada), or, the coastal perimeter of the North Pacific extending from northeast Asia to northwestern North America. Both the interior Arctic steppe-tundra ecosystem and the coastal routes may have provided incentives (by way of diverse and occasionally abundant game animal populations toward the interior or the “kelp highway” advantages of the coastal settings). Current evidence would nevertheless suggest that the western Canadian Corridor region probably remained closed until too late a point in time to account for initial colonization of the Americas (unless initial colonization was a pre-Late Glacial Maximum [LGM] process). While it therefore appears likely that initial settlement of the Americas took place along a coastal route, one can hardly conclude that this alternative route lacked its own challenges. Refugia such as Haida Gwaii may have beckoned, but intermediate stretches with active glaciers calving well into the Pacific must have been formidable obstacles. The linear configurations of either littoral northwestern North America or the glacially delimited interior Corridor region would also present their own structural challenges to successful colonization, irrespective of the environmental characteristics associated with them (Moore 2001:406; Wobst 1976:56). Pioneering populations would likely be aware that no human populations ever lay to their east or southeast, and it is legitimate to wonder if groups proceeding by either route might have been aware of the fragility of their low-density populations. Might they have chosen to exercise conscious control over ways to ensure that there was meaningful access to spouses, so that populations could grow when things went well?

### 10.3.1 *Elementary Kin Structures in Band Societies*

To answer such a question, we must frame some theory around the kin structures typical of band societies—for marriage alternatives are inevitably closely intertwined with cultural definitions of affines and consanguines. Rather than seeking “average” cross-cultural generalizations (that impose the analyst’s categories, such as conjugal pairs, nuclear families, and other concepts), I wish to explore instead the ramifications of the internal logic of kin semantics as they are applied in hunter-gather settings. In this regard, it is critical to take into account the views of knowledgeable members of the societies about which we enquire.

There is a large class of elementary kin structures in which band societies exert control over how narrowly or broadly the range for potential spouses is defined. These are societies that make distinctions between cross and parallel relatives, whose categorical status is defined by associative rules concerning same or opposite sex linking relatives. In the case of one set of alternatives, Dravidian kin systems, it is possible to show that categories for parallel relatives (traced through same sex-linking relatives) are isomorphic with blood or consanguineal kin persons, whereas categories for cross-relatives are isomorphic with actual or potential affines (Trautmann 1981). Dravidian kin terminologies



**Fig. 10.1** A schematic showing how, when like- or unlike-sex sibling cores are combined with kin terminological conventions based upon the logic of bilateral cross-cousin marriage (Dravidian or Type A semantic structure), they have completely different outcomes for marriage prospects in the subsequent generation: **(a)** Unlike- (*top*) and like- (*bottom*) sex sibling cores; **(b)** Cross-relative categories created by bilateral cross-cousin marriage; **(c)** the siblings created by like-sex sibling cores; **(d)** the marriageable cross-cousins created by an unlike-sex sibling core

explicitly encode the semantic distinctions arising from bilateral or symmetrical cross-cousin marriage. Dravidian (or conceptually related) kin systems are common in North and South America, India, and Australia.

When kin principles of this sort occur in small scale societies, such as we see in Subarctic Dene, Subarctic Algonquian, and Great Basin Numic cases, they have profound demographic impacts (Asch 1980, 1988; Ives 1990, 1998; Ridington 1968a, 1969). These societies have principles of group formation in which microbands or co-resident local groups are conceived of as a group of brothers who have married a group of sisters, or, as a group of brothers and sisters who have married another group of brothers and sisters. As Fig. 10.1 shows, this has immediate consequences.<sup>1</sup> Where the sibling core

<sup>1</sup> Figure 10.1 is a considerable simplification arising from Dravidian kin semantics, used here for illustrative purposes. It is important to remain aware that the associative rules used to classify more distant relatives (for example, the potential affine mother's mother's brother's daughter's daughter) can be the subject of elaborate mathematical description (Godelier et al. 1998). This abstract semantic dimension is further complicated by the vagaries of real world genealogical tracings, with multiple pathways even for one individual. In fact, not all members of a society are apt to possess such detailed knowledge. In the world of the Mackenzie Basin Dene, that knowledge lies in the domain of elderly women, who can distinguish real and classificatory siblings from potential marriage partners, for instance (Asch 1998). When Dene women from distant communities meet, it is common to hear them begin tracing out individuals they have in common, and therefore, how they might be related, as part of a vast web of kin ties that can extend over hundreds of kilometers.

is of like-sex members (brothers married to sisters), all children will be siblings and parallel cousins; they will both refer to and treat each other as siblings, with whom marriage is sanctioned. This sibling core configuration enjoins exogamy upon the small group. Where the sibling core is composed of unlike-sex members (a brother and sister married to a brother and sister), children will be either siblings or cross-cousins. Cross-cousins *can* marry each other. This sibling core configuration allows endogamy for even such a tiny group, in contradistinction to Moore's (2001) modeling supposition.

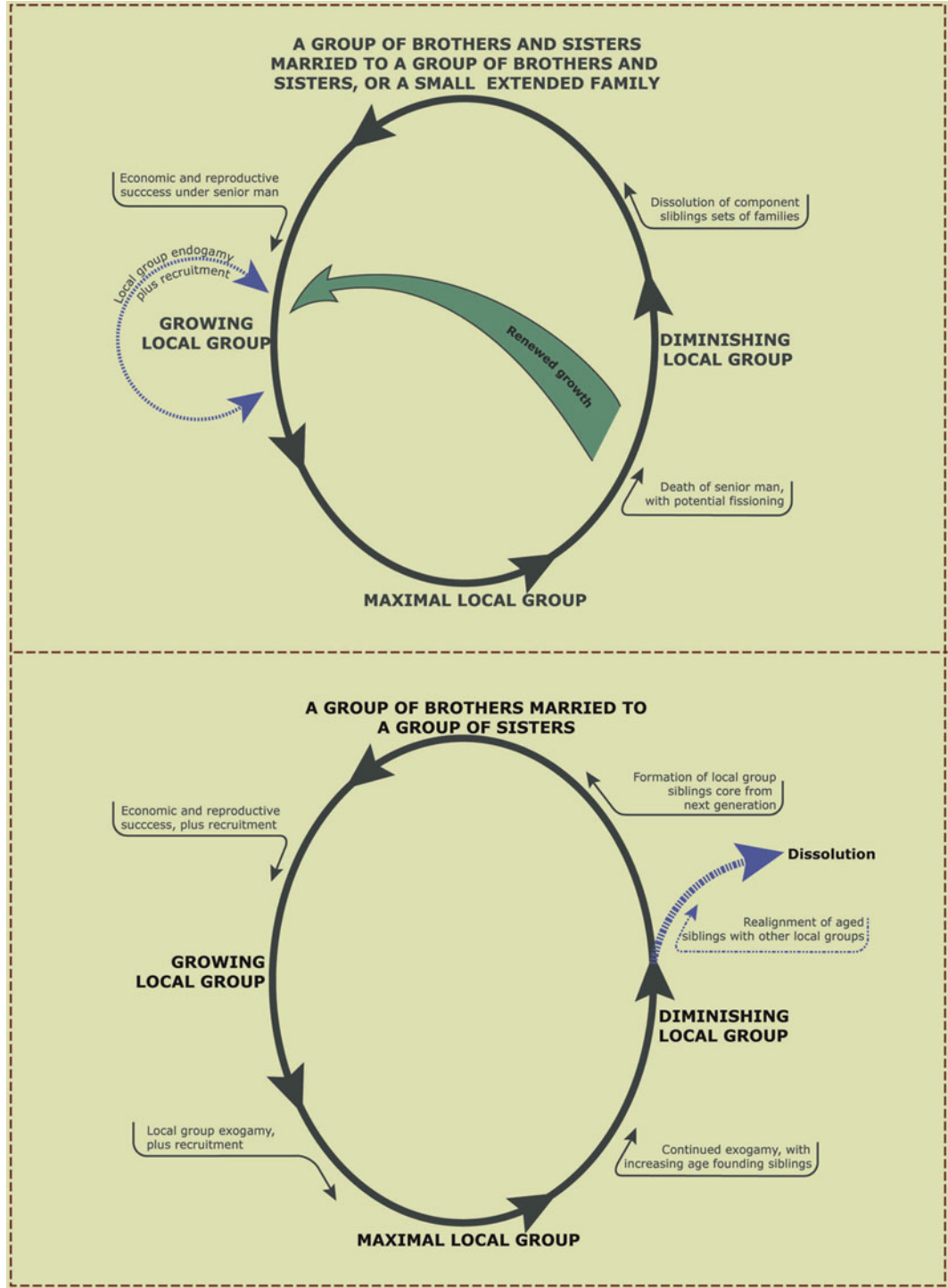
It is at this point that we must think "longitudinally" about the generational trajectory of microbands. For any specific instance, principles of group formation will express themselves in a variety of ways resulting in different developmental processes (Fig. 10.2, top). In the Dunne-za (Beaver Dene) case, for instance, local groups that experience success can grow both through having children as well as external recruitment. When the children of the founding generation reach maturity, they can marry (and may very well be encouraged to marry) cross-cousins within the local group, which can then enjoy another generation of sustained growth. Local groups that do especially well can make a transit from a handful of founding siblings to a large aggregate of individuals that dominates or literally *is* the regional marriage isolate. Eventually, other factors intervene. These include tensions driving apart the senior figures in the group, strife between siblings, or the simple fact that Subarctic ecosystems cannot indefinitely sustain rather large population aggregates. The group dissolves, dispersing its members to other local groups or resulting in the founding of new smaller groups to begin this cycle again. Fission, then, is largely the consequence of the successful internal growth of the founding sibling sets over a series of generations, punctuated by episodes of dissolution with a variety of proximal causes (e.g., Johnston 1982; Ridington 1968b).

The Dehcho Dene followed another pattern in developmental processes (Fig. 10.2, bottom). Here, a local group could be founded by a small set of siblings and experience success through its next generation. It is at this point that the impact of forcing local group exogamy is felt. There are no spouses to be found within such a group, where all in the children's generation are siblings. In the Dehcho Dene case, a principal of "unilocality" comes into play (Asch 1980). A child of one sex may marry out, in which case the remaining siblings of that sex will do the same. Children of the opposite sex remain, with their spouses entering the local group. The upshot of this form of developmental process is that groups either cycle within a rather narrowly defined size range, or simply disappear within a generation or two, with younger sibling sets forming new groups elsewhere. Groups tend not so much to fission, but to form, disappear, and form once again.

### 10.3.2 Generalizing the Dene Pattern

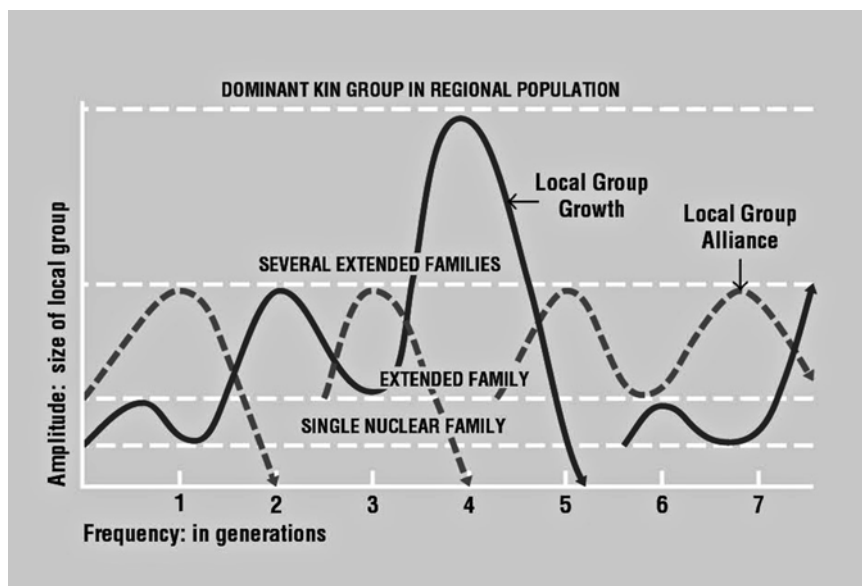
Even within the Dene world, there are a number of variant factors that influence the precise form of developmental processes and patterns that group fissioning may take. These include the relative concentration (e.g., a group of brothers marry a group of sisters) or dispersal (e.g., brothers and sisters marry a wide variety of spouses) of affinal ties, customs in care of the elderly (i.e., in the founding generation), the degree to which affinal versus sibling working relationships are privileged, affective sentiments toward egalitarian or more structured social environments, and so forth (Ives 1990; Stevenson 1997). Yet, underlying these variant features, some elementary forces are at work, concerning the balance of natality, mortality, and the recruitment or loss of personnel. Very similar themes and processes show up in Numic, Algonquian, and Western Desert communities in Australia. These underlying forces allow us to articulate two strong tendencies that arise from the sibling core dichotomy in a more generalized model. These may be framed as *Local Group Growth* and *Local Group Alliance* options. The different intergenerational "fabrics" these options would contribute to an archaeological record are captured in Fig. 10.3.

*Local Group Growth* systems feature unlike-sex sibling cores, make extensive cross-parallel kin distinctions, are agamous or actively promote endogamy, and consequently have inwardly focused



**Fig. 10.2** Contrasting intergenerational developmental processes for Dunne-za (Beaver Dene, endogamous, *top diagram*) and Dehcho (Slavey, exogamous, *bottom*) local groups





**Fig. 10.3** Intergenerational properties of idealized Local Group Growth (endogamous) versus Local Group Alliance (exogamous) options, plotted as local group size against elapsing generations

alliance patterns (Ives 1998). Microbands occur in a wider range of sizes; where they experience economic and demographic success, they can have significant intergenerational duration and may actually grow from modest sizes into bilateral kindreds that dominate the regional marriage isolate. They are “implosive” and characteristically restrict the circulation of individuals within regional marriage isolates. *Local Group Alliance* systems, on the other hand, often have like-sex sibling cores and a profound emphasis upon exogamy (Ives 1998). This impetus can be extremely powerful; some Dene groups, for example, applied these general principles even where unlike-sex sibling cores were permitted. In these instances, however, the kin terminology is shifted, so that crossness in the zero generation is extinguished: all children are terminologically siblings, eliminating the prospect of endogamous marriage (“Mackenzie Basin” terminologies, cf. Spier 1925; Ives 1998). The upshot of this is a situation in which local groups “pump out” personnel within and beyond regional marriage isolates. Local Group Alliance systems yield microbands with narrower size ranges and short intergenerational duration. They seek political and economic accommodations to external environments by linking microbands together through their extensive alliance networks.

Thus, for societies applying this class of kin principles, it is more accurate to say that they make deliberate choices about where the sociogeographic locus of the incest taboo will be situated. The impetus to shift this locus outside the local group is strong, because it fostered the creation of a web of kin ties providing local groups with important options when the exigencies of Subarctic or Great Basin life inflicted hardship. Consider, for instance, the situation Dene or Innu groups using treeline intercept strategies would find themselves in at times when caribou failed to materialize along a regular migration route. The capacity to call upon relatives elsewhere would provide the kind of “safety net” Whallon (2006) has noted in his work with late Upper Paleolithic and Mesolithic societies in Germany.

A strategy focusing upon endogamy is not without its attractive qualities, however. Where local groups experience success within the course of a generation, their membership grows both through endogamy and recruitment. A tiny group such as that shown in Fig. 10.1d could not undertake

communal game hunting on its own or easily resist the depredations of large “Big Man”-oriented aggregates, such as those that accompanied the early Subarctic Fur Trade. A group that has grown through both internal and external recruitment can explore these options independently. At the phenomenally low human population densities that accompanied early Paleoindian colonization, such advantages would scarcely have gone unnoticed in settings where finding a marriage partner would have posed extraordinary challenges. Deliberately positioning the sociogeographic locus at which marriages could occur *inside* the local group would have obvious advantages. The disadvantage is that groups following these developmental processes more consistently forego opportunities to forge external alliances and are comparatively isolated from surrounding populations.

If Paleoindian kin systems did provide an idiom or framework in which the biological realities of human reproduction and socioeconomic organization were expressed, and if developmental processes of these sorts existed in this era of phenomenally low population densities, they would have some particularly interesting ramifications for the archaeological record. But did they?

## 10.4 Warranting the Use of Specific Kin Forms in Modelling the Paleoindian World

One can legitimately ask if there are valid reasons why some kin structures would be more likely to have been present than others in Paleoindian contexts. In fact, there are five reasons for making such assumptions. First, Hill et al. (2011) used a database of 32 hunter-gatherer populations from around the world to show distinct trends in hunter-gatherer residence. Their conclusions arise from an empirical treatment of data rather than attention to normative statements of cultural rules. Intriguingly, they find sibling philopatry exists at quite high levels (approaching 40 % for brothers and 35 % for brothers and sisters): sibling sets lie at the core of this cross-cultural gathering of data concerning hunter-gatherer populations, providing an empirical warrant for the significance we have attached to sibling sets in the foregoing discussion. Groups of brothers are likely to continue to reside together. Beyond these particular kin relationships, however, the majority of people within the groups surveyed were not closely related to each other in genetic terms. Hill et al. (2011) suspect these types of co-residential arrangements, novel among primates, were significant in human evolution. Sibling cores, then, are a regular occurrence in diverse hunter-gatherer populations, a finding making it quite reasonable to think this would be so for Paleoindian populations.

This brings us to our second reason for thinking cross-parallel distinctions existed in the Paleoindian time frame, the matter of archetypal kin structures. Allen (2003, 2008) has made a cogent argument that the original human kin system had a tetradic form, in which eight categorical terms (four distributed across each of repeating parental and children’s generations), featuring cross-parallel distinctions, alternated through the generations, linking opposite sex sibling cores. Simple Australian section systems and Dravidian kin systems are straightforward derivatives of the tetradic model (with greater differentiation of generations and elder–younger distinctions). It is logically possible to derive all other variability in human kin systems from a tetradic prototype. Allen (2008:112) has suggested that tetradic kin systems or their derivatives may have dispersed from sub-Saharan Africa with culturally and anatomically modern human populations. Without necessarily agreeing with all details of Allen’s approach, this certainly could be so. Kin systems making cross-parallel distinctions might have remained widely current in the late Paleolithic world as ancestral Paleoindian populations were organized near Beringia (cf. Raghavan et al. 2014; Rasmussen et al. 2014; Tamm et al. 2007).

Third, if we canvas detailed kin reconstructions within the reach of historical linguistic techniques, we find once again that cross-parallel distinctions of Dravidian type come to the fore. Some casual probing shows that reconstructions of Proto-Dene-Eyak, Proto-Alongquian, Proto-Numic, and Proto-Mayan kin terminologies, for example, all featured cross-parallel distinctions mapping cross relatives

as affines in Dravidian or Kariera form (Hage 2003; Hage et al. 2004; Hockett 1964; Ives 1990; Krauss n.d./1977; Wheeler 1982). Thus, one could argue that in roughly the mid-Holocene, such kin systems were quite widespread in North America; it is likely their more ancient antecedents would have had related structural properties.

Fourth, while we have focused upon cross-parallel distinctions as these are related to Dravidian crossness, a number of scholars have suggested that there are historical relationships among Dravidian, Iroquoian, and Crow–Omaha systems, with progressive transformations among these different kin systems (e.g., Ives 1998; Ives et al. 2010; Trautmann and Barnes 1998). The precise mapping of the Dravidian cross-parallel categories is the more straightforward one because of its logical connection to bilateral cross-cousin marriage. Even so, leading scholars in kin studies have viewed the several modalities in the dimension of crossness (Australian, Dravidian, Iroquoian, Yafar, and Kuman) not as completely different, but rather as dialectical variation in a “language” of crossness, which in every case has an affinal implication (see various papers in Godelier et al. 1998). These “species” of crossness have a vast spread in both North and South America that may reflect the transformation of Dravidian-like systems toward the more complex alliance regimes we see with Iroquoian and Crow–Omaha systems. Some form of cross-parallel reckoning may lie at the base of historical developments in most language families in the Americas. Again, with little effort at compiling such numbers, we find that cross-parallel distinctions are known for Inuit, Tsimshian, Haida, Tlingit, Eyak, Athapaskan, Algonquian, Siouan, Iroquoian, Uto-Aztecan, Mayan, Chibchan, Carib, Panoan, Yanomamö, Tukunoan, and Jivaroan (Godelier et al. 1998; Spier 1925). Purely in logical and distributional terms, then, there would seem to be a strong *prima facie* case that the first kin systems to enter the New World were classificatory in Morgan’s sense and that they made cross-parallel distinctions (cf. Ives 1998).

Archaeological evidence for such kin distinctions is of course limited. That is not to say the archaeological record is entirely mute on this account, however. As Levi-Strauss (1963) noted, some societies have a noteworthy tendency to map their social structure onto settlements (see also Means 2007). This is especially prevalent in societies with dual organization, where the two halves of a society are reflected in linear or circular arrangements of settlements with bilateral or concentric symmetry. Bilateral or symmetrical cross-cousin marriage commonly accompanies such spatial organization of settlements; kin terminologies with cross/parallel distinctions are typical in these settings.

Upper Paleolithic sites in the Ukraine and on the central Russian Plain have just such settlement features, with both circular arrangements of circular structures and “long house-like” dwellings with rows of central hearths (see the plans in Klein 1973 and Soffer 1985). In some instances, these sites have produced split image art,<sup>2</sup> which frequently accompanies dual organization in concentric or other forms (Levi-Strauss 1963). The Mal’ta-Afontova sites, generally regarded as the easternmost extension of this phenomenon, feature substantial semi-subterranean dwellings, figurines, and other mobiliary ivory art (Medvedev 1998). This vast Upper Paleolithic sphere, lying adjacent to the northeast Asian realm in which early Paleoindian populations must have been organized, has therefore produced important evidence of societies with sophisticated conceptions of social organization, very likely including corporate kin groups (clans or lineages of some type) (see Raghavan et al. 2014 and Rasmussen et al. 2014 for the genetic implications regarding the Mal’ta and Anzick children, and Soffer 1985 regarding corporate groups). As we proceed yet farther to the east, the archaeological record is generally silent with respect to social structure, although the small, semi-subterranean dwellings in the Ushki Component 7 layer tend to occur in pairs, as we might expect in simple expressions of dual organization (see the plans in Dikov and Titov 1984:77).

<sup>2</sup> The painted mammoth skull from Mezerich illustrated by Soffer (1985:78, Fig. 2.73), for example, has a design that curves somewhat, but otherwise has nearly perfect symmetry; almost every design element to the left of the mid-line is mirrored to the right.

The Paleoindian record in the Americas has also largely been silent, save for one spectacular exception, the Bull Brook site in Massachusetts. As Robinson et al. (2009) have documented, the site appears to be a large fall or winter aggregation locale situated at a strategic location with respect to communal caribou hunting. It consists of 32 artifact-rich “hot spots” arrayed in a ring structure, for which refitting studies revealed contemporaneous occupation of the various loci. This ring also has concentric differentiation of functional activities. Among the well-chosen ethnographic analogies that Robinson et al. (2009) cite are the large group camps Slobodin (1962) documented for the Dene Gwich’in, where exogamous sibs were situated on opposite sides of a circle, with more aged dependents arranged behind each of the family encampments within the circle. Noble’s Pond and a few other Paleoindian sites have suggestive traces of such patterning, but the precise circumstances in which we can trace this are rare (Seeman 1994). Suffice it to say that were one to diagram a site in which there were conceptions of duality, linked to cross-parallel distinctions in kin terminologies and broader social entities, the result would be very much like Bull Brook.

Thus, we are not engaging in flights of fancy if, in thinking about Paleoindian socioeconomic organization, we apply ideas based on kin systems structured by cross-parallel distinctions. Rather, a minimal statement would be that any conceptual or quantitative modeling of Paleoindian demography and kin systems must at least include alternatives in which cross/parallel distinctions were an important feature of social life. A stronger statement of this sentiment would be that extensive hunter-gatherer co-residential data, logical and historical inferences make kin systems with cross-parallel distinctions the *preferred* modelling candidate.<sup>3</sup>

## 10.5 Applying the Thought Model to the Initial Settlement of the New World

It is reasonable therefore to conceive of a late Pleistocene northeast Asian world in which there were groups using similar semantic frameworks for kinship, involving cross-parallel distinctions, whether they shared close ties of language and culture, or not. This basic framework might well be accompanied by a number of ancillary features of kinship and marriage that tend to accompany cross-parallel distinctions. These include the levirate, sororate, and polygamy. Though the interplay of these factors would be complex, the shared, underlying kin template would be capable of generating a range of options for the socioeconomic reproduction of societies, but with a critically important dichotomy.

In certain populations, the strategy of choice would be to keep the sociogeographic boundary for permissible marriages close at hand, within co-resident microbands. Endogamous arrangements would maximize the prospects of finding a marriage partner in small, low density populations. Yet, following this logical pathway would create conditions for a variety of other outcomes, each with prospective archaeological signatures. These are summarized in Table 10.1. Given our focus on migration, it is worth emphasizing that exploration of a Local Group Growth framework could very well lead to situations in which relatively endogamous groups were propelled apart in fissioning processes as generations elapsed. These groups would maximize retention of potential affinal ties in the short

<sup>3</sup> This is not to say that other modeling scenarios could not be developed for kin systems that are of cognatic character, for instance, calculating degrees of relatedness, rather than absolute categorical prescriptions of affinity and consanguinity as we see in systems reckoning cross-parallel distinctions. The Nadleh Whut’en (southern Carrier), for instance, have a cognatic terminology with marriage rules governed by the *Law of Four Sticks*, which stipulated that neither siblings nor first, second, or third cousins could marry (McQuary and Poser 1996). I will leave modelling of logical possibilities in these semantic realms to be explored by others more familiar with such kin systems, but observe that the upshot of requiring marriages at four removes or beyond provides for a highly exogamous alternative akin to Local Group Alliance distinctions.

**Table 10.1** Characteristics and archaeological implications of a Local Group Growth framework

Local Group Growth (agamous to endogamous)	Archaeological implications
<i>Implosive</i> : restricted circulation of individuals	Enhanced potential for cultural drift and style “enclaves”
<i>Successful local groups</i> : sporadic but potentially of longer intergenerational duration	Long-term range occupancy with focal landscape signatures
<i>Economic accommodation</i> : through population growth	Foraging coexists with sporadic communal game hunting
<i>Colonization mode</i> : prone to growth and fission with limited external ties	“Leapfrog” or “outpost” patterns potentially lacking landscape connectivity

**Table 10.2** Characteristics and archaeological implications of a Local Group Alliance framework

Local Group Alliance (exogamous)	Archaeological implications
<i>Pumping out</i> : wide circulation of individuals	Diminished potential for cultural drift with stylistic variability diffused through and beyond immediate region
<i>Successful local groups</i> : tend to dissolve and reassemble through elapsing generations	Long-term range occupancy shifts throughout a larger landscape
<i>Economic accommodation</i> : through allying groups	Foraging with consistent seasonal capacity for communal game hunting
<i>Colonization mode</i> : repositioning of “webs” of individuals or local groups across range	“Matrix” or “string of pearls” patterns, with strong landscape connectivity

term. In the longer term, these groups would run the risks connected with demographic stochasticity noted earlier (though in a dynamic late glacial world full of other notable risks).

Other populations could favor strategies that pushed the sociogeographic boundary for permissible marriages outward, beyond co-resident microbands (Table 10.2). This would enhance the potential for external social ties (creating a broader social “safety net” in that dynamic late glacial world), but this strategy would diminish the pool of prospective marriage partners both within and beyond the immediate co-residential group. In all likelihood, successful colonization activities would require a greater degree of “demographic potential,” with higher population densities and more continuously distributed groups to ensure the long-term socioeconomic reproduction of societies following this logical pathway.

**10.5.1 Conceptualizing Social Conditions in Paleoindian Times**

One of the more enduring puzzles connected with New World colonization continues to lie in the rarity of sites that clearly pre-date the Clovis “interval” [defined by Waters and Stafford (2007) as 11,050–10,800 <sup>14</sup>C year BP]. Sites that are, or are coming to be, accepted as legitimately pre-Clovis are few in number and widely separated in time and space, whether in eastern Beringia or south of the Late Wisconsinan ice masses in the Americas. If initial settlement of the Americas proceeded in a relatively continuous fashion once established colonizers produced descendant populations (as in various wave-of-advance models and as would be predicted from a Local Group Alliance framework), one would think that a number of continuously distributed early sites should be present. While it is true that geological factors or difficulties in recognizing early sites yielding non-diagnostic artifacts could contribute to this pattern, it seems odd that more early sites have not come to light purely by chance. The degree of modern urban and industrial development in North America has been extraordinary, and one would think that if early sites were widely present, more of them would have been discovered in this fashion alone—never mind deliberate archaeological efforts to detect them. Instead, Adovasio and Pedler (2013) and Collins et al. (2013) discuss 30 or fewer sites in pre-Clovis contention in the entire western hemisphere.

If we accept for the moment that this early site distribution may be an actual representation of the archaeological record rather than a result of taphonomy or discovery, some interesting alternative possibilities can be explored. Migration conditioned by a Local Group Growth framework, where there was a primary concern with endogamous retention of affines, would lead us to predict discontinuous, episodic colonization processes resulting in leap frog and outpost styles of settlement, with archaeological residues that could be widely separated in time and space. This general situation corresponds rather well to our current understanding of the pre-Clovis and early Clovis world in the Americas. Logically, we expect there to have been pre-Clovis populations in eastern Beringia, even if we experience difficulties in detecting some of them (i.e., the combined impact of postglacial eustasy and isostasy that would affect sites along the southern edge of the Bering platform and British Columbia). Alaska does provide a few key interior loci, with various combinations of pre-Clovis, Clovis-aged, and post-Clovis-aged sites in the Tanana River valley (e.g., Swan Point, Broken Mammoth, Mead, and Upward Sun), the Nenana River (e.g., Dry Creek, Walker Road, Moose Creek), and the north slope (Tuluq and various sites yielding Sluiceway points through to later Mesa materials) [see various papers in Goebel and Buvit (2011) for a current summary, along with Potter et al. (2011, 2013)]. In the Yukon there are enigmatic traces of possible bone technology prior to the onset of the LGM (i.e., more than roughly 22,000 radiocarbon years ago), including the earlier deposits in the Bluefish Caves, with post-LGM materials that extend from pre-Clovis time onward (Morlan 2003; Morlan and Cinq-Mars 1982). Emerging evidence (Serpentine Hot Springs, Raven Bluff) is showing in a more definitive way that fluting technology arrived in eastern Beringia after this earlier time range, in the Younger Dryas interval (ca. 10,400 radiocarbon years ago), presumably from southern sources (Smith et al. 2013; Goebel et al. 2013).

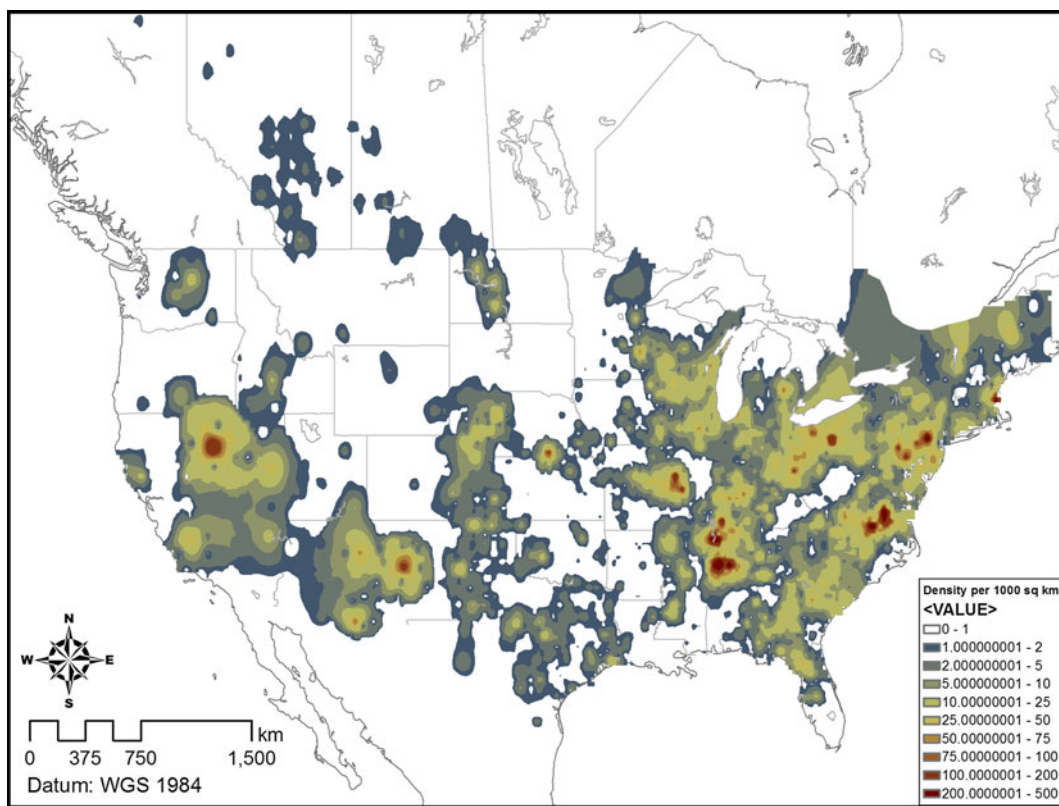
In this volume, Anderson, Braje, Dixon, and Politis review sites south of the ice masses in North America and in South America that I will briefly mention here, among them Paisley Cave, Manis, Santa Rosa, Hebior, Gault, Meadowcroft, Cactus Hill, as well as Monte Verde and a variety of South American sites. These also appear to provide a series of loci that are again relatively isolated from each other. (Gruhn and Bryan 2011 provide a useful overview, in which the pattern under discussion is evident). Holen (2005) and Stanford and Bradley (2012) discuss yet other sites that may reflect early human presence south of the ice masses during the LGM.

Because this pattern fits with general precepts of the model, it is worth pointing out that there is also support in more refined mathematical modeling of colonization events. Steele (2009) reviewed biological modelling efforts to incorporate more realistic factors like anisotropic environmental gradients and the Allee Effect. The Allee Effect posits that low-density populations face genuine constraints over successful reproduction; a colonization event may fail if it does not satisfactorily transcend certain threshold values and spatial configurations (Lewis and Kareiva 1993). Steele found that stochastic factors are likely to be influential in the evolution of a front driven by dispersal behavior of these more complex kinds, concluding that the consequence "...may be a *chaotic-seeming series of outbreaks of secondary dispersal foci ahead of the main front*" (Steele 2009:131; my emphasis).

Steele (2009:129; Hazelwood and Steele 2003) also observed that the archaeological response variable for colonization events was *not* first arrival time, but rather, the cumulative occupancy signature when the archaeological signal is the time-averaged density of discarded artifacts. Such a statement puts us in mind of Anderson and Gillam's (2001) fluted point density maps.<sup>4</sup> Anderson and Gillam (2000) used Geographic Information System (GIS) analyses to project likely terminal Pleistocene pathways of human movement in North America, with the two chief options including a

<sup>4</sup> Such factors as the chronological length of the fluted point era, modern population densities, degree of cultivation, collecting histories and other key factors can and have acted to bias this fluted point density pattern. Nevertheless, even in dedicated efforts to detect sources of bias concerning this pattern, several authors indicate that there remains an underlying degree of "patchiness" in this distribution that cannot entirely be attributed to biasing factors, and does seem to be a property of the fluted point distribution in North America (e.g., Buchanan 2003; Prasciunas 2011:122).





**Fig. 10.4** Density isopleths for fluted points using the Paleoindian Database of the Americas and the Western Canadian Fluted Point Database, plotted using the Inverse Distance Weighted method in Arc Map 10, with densities of fluted points per 1,000 km<sup>2</sup> (Anderson et al. 2010 and this volume; Ives et al. 2013)

Pacific coastal route and passage through a deglaciating “Ice Free” Corridor along the eastern slopes of the Rockies. They described two primary modes of colonization, in part related to the geography of both the coastal and Corridor routes, these being “String of Pearls” and “Leap Frog” patterns. Applying idealized settlement catchments of 400 km in diameter, Anderson and Gillam conceived of the String of Pearls mode as an option with continuous, progressive settlement along the linear migration routes, with subsequent linear expansion into the lower 48 states. The Leap Frog mode saw discontinuous, spatially discrete episodes in the colonization event.

These authors assembled maps with density isopleths for the frequency of fluted points (a logical proxy one might use for Steele’s “cumulative occupancy signature”) to examine broader spatial patterning in this early era of North American settlement. Anderson and Gillam (2000) argued that the pattern evident in fluted point densities is consistent with a Leap Frog style of colonization. Anderson and Gillam’s data is presented in Fig. 10.4, but in this case with density values for the western Canadian Corridor region (see Ives 2006; Ives et al. 2013).

Moore and Moseley (2001; Moore 2001) had constructed their own model of colonization processes, and in response to Anderson and Gillam, argued that the demographic properties of small-scale hunter-gatherer societies weighed prohibitively against any New World colonization option other than a matrix or String of Pearls configuration. It was in this context, as noted earlier, that Moore and Moseley (2001) modeled a single option for a kin configuration in which crossness is extinguished across most of ego’s generation. Moore and Moseley’s model provisions would, as we can see from

the proposals made here, enforce local group exogamy, driving demographic results toward something like a Local Group Alliance strategy, and indeed, requiring a String of Pearls framework. By virtue of constructing a more expansive kinship model as attempted here, it is clear that populations could choose to explore different group forming strategies, even though they shared the same kin-structured semantic framework. In contradistinction to Moore and Moseley, groups that chose to apply Local Group Growth options (endogamous principles of group formation to counteract very low population densities) could definitely yield a Leap Frog pattern (cf. Anderson and Gillam 2001:532).

The Local Group Growth scenario also predicts a related pattern one seldom hears about: that of failed or *partially* successful colonization events [although this is noted by Anderson and Gillam (2001:531); see also Holly's (2011) thought-provoking remarks in this connection]. Predominantly endogamous daughter populations, subsequent to fissioning from a parent group, would have a real capacity for persistence over more than one generation. We are predisposed to think of permanently successful fissioning and colonization episodes, but by virtue of their relative social isolation in a terminal Pleistocene world of extremely low population densities, some endogamous groups might have lasted for only those few generations (the two to three centuries of the various models noted above). Such groups *could* leave detectable though isolated archaeological signatures that nevertheless failed to yield descendant populations.

Thus, at this broad conceptual level, adopting a perspective better informed by kin principles results in a series of propositions about the Paleoindian era that are plausible, consistent with large scale patterning in that record, and capable of promoting novel interpretations that merit further serious consideration. More than this, however, the thought model created here illuminates the logical mechanisms underlying group forming principles in a way that sheds light not merely on the colonization process itself, but on attendant phenomena (as outlined in Tables 10.1 and 10.2). These too can be mined for test implications that might be found in the archaeological record.

There has been, for example, sustained debate about whether early Paleoindian societies were specialists in hunting terminal Pleistocene megafauna, or more generalized foragers. Seldom considered in these discussions is the fact that communal large game hunting, whether of proboscideans, bison, or caribou, is invariably situated in a social context. It requires a larger number of people to execute some type of drive or surround strategy and, similarly, a larger number of people to process the meat, hides, and other products of a successful hunt. Local Group Growth and Local Group Alliance systems are both fully capable of engaging in communal hunting, but they achieve this in different ways (see Ives 1990 for a fuller treatment). In the endogamous alternative, a group would typically have its onset as a small number of people, who because of their relative social isolation would largely be constrained to be small group foragers. Where such groups experience demographic success, they literally grow into a size range where the labor needs of communal hunting can be met directly by the local group. We thus predict episodic, irregular approaches to communal game hunting in this alternative; while larger group sizes prevailed, communal hunting might take place across a greater number of seasons. In the Local Group Alliance scenario, the social context for communal game hunting resides in the web of exogamous ties shared among local groups that would facilitate sustained and regular interaction. By linking themselves together in large seasonal gatherings, predominantly exogamous groups could engage in systematic, relatively regular communal hunting.

It is not so much that these pioneering populations must be characterized as megafaunal specialists at the expense of broader spectrum foraging, or vice versa, but rather that an intergenerational perspective on group-forming principles lets us grasp when and how these different tactics may be applied *during phases in the life histories of small hunter-gatherer populations*. What appear to be episodes of intensive mammoth hunting the San Pedro valley of Arizona at sites such as Murray Springs, Naco, and Lehner Ranch or the Colby locality in Wyoming can thus be seen in a different light, as can the probable caribou intercept strategy revealed at Bull Brook (Frison and Todd 1986; Haynes and Huckell 2007; Robinson et al. 2009).

Mention of the Colby site brings to mind another avenue of approach. The Colby fluted points are distinctive, featuring deeper basal concavities and a “lobed” appearance, a morphology also present in the Fenn Cache (Frison and Bradley 1999; Frison and Todd 1986). These properties undoubtedly result from the reshaping of larger fluted points that had broken near their bases, just as Bradley et al. (2010:185) indicate; yet, few other reshaped fluted points appear just like this. Regional and continental microstylistic variability in fluted points could yield valuable information when viewed from the perspective of the thought model entertained here (cf. Buchanan and Hamilton 2009; Morrow and Morrow 1999). We generally assume that face-to-face interaction conditions learning in connection with the making of material culture. Because rates of exogamy also condition the degree of circulation of personnel in a society, they could also have significant impacts on the transmission of knowledge about material culture. In the Local Group Growth alternative, there is more limited circulation of people in the wider regional society precisely because of endogamous retention of personnel. Logically, one expects a greater degree of “cultural drift” through time and the formation of style enclaves. Because exogamy systematically promotes the circulation of people more widely beyond their natal groups, one would expect a greater degree of homogeneity to arise in various spheres of material culture. These topics are also approachable in the archaeological record. Lohse (2010) makes a speculative, but fascinating assessment of how skill transmission might be reflected in archaeological records, where this might be detectable in blade manufacture at the Gault Site in Texas.

Each of these topics has significant research potential, but they require more comprehensive treatment than can be provided here. To conclude, then, let us shift our attention to one sector of the Paleoindian record for which we can acquire empirical information comparatively readily and investigate its properties for western Canada.

## 10.6 Lithic Conveyancing in Paleoindian Assemblages in Western Canada

Once regarded as the only viable migration route from eastern Beringia into the Americas, the “Ice Free Corridor” (and variant concepts<sup>5</sup>) slipped into scientific obscurity as increasingly ancient sites south of the Late Wisconsinan ice masses came to light, and interest in a coastal migration route flourished. The Corridor region is frequently portrayed as intensively studied by archaeologists and earth scientists, but this simply is not the case (cf. Landals 2008; Stanford and Bradley 2012:7). It comprises a vast, partially investigated region, greatly affected by dynamic late glacial and early Holocene geological processes with immense capacity to obscure or eradicate early archaeological sites (e.g., Mandryk 1992, 1996). Consequently, there are few well-stratified, radiometrically dated sites, Charlie Lake Cave and Vermilion Lakes foremost among them, to match the more extensive record for such sites south of the ice masses (Driver et al. 1996; Fedje et al. 1995). This should not be taken to mean that such sites never existed in Alberta. Instances such as the St. Mary and Lake Minnewanka Reservoirs show just why archaeologists face such challenges in detecting early sites with these characteristics. After a few episodes of draw down maintenance over several decades, during which there was exposure to the high intensity winds common in southern Alberta, Kooyman et al. (2001) estimated that the St. Mary Basin lost a minimum of 1.5–2.0 m of sediment on average, along its 19 km length. In the late 1990s, these processes revealed the dramatic Pleistocene trackways, the Clovis aged

<sup>5</sup>I will use the term “Corridor” *sensu lato* to refer to regions principally east of the Rockies, where continental ice flowed toward and in some instances coalesced with ice masses of Cordilleran origin during the Late Wisconsinan (Ives et al. 2013). The term “Corridor” has some value in characterizing the long “seam” that expanded as deglaciation proceeded, but the entire scenario was time and space transgressive. As we proceed into post-glacial time, the notion of a corridor becomes less and less helpful, although that broadening zone is of considerable archaeological interest. Mandryk (1992) provided a history of the Corridor concept.

fauna, the nearby presence of fluted points with evidence of horse and bovid exploitation, and finally, the butchered camel present there. The horse and camel elements of the faunal assemblage averaged  $11,450 \pm 14\text{C yr BP}$  (Waters et al. 2015). In other instances, Paleoindian materials occur in archaeologically rich yet poorly stratified sites occupied throughout the Holocene, leaving diagnostic projectile points as the only indicator of time depth and requiring great caution in assessing which other artifacts might be connected with an early occupation.

Despite this, the Corridor region continues to hold a considerable degree of interest for what might be called a series of “second order” problems in the earliest phases of New World prehistory. Antecedent, terminal Pleistocene populations in eastern Beringia (Alaska and the Yukon)—some of which are demonstrably pre-Clovis as well as Clovis contemporaneous—must have been separated from pre-Clovis and Clovis-aged populations south of the ice masses for some considerable period of time. Depending upon how long ago one thinks human populations arrived in Beringia and then were established south of the ice masses, the interval would be at least one millennium and perhaps a few millennia, prior to the physical and biotic opening of the Corridor ca. 12,000  $14\text{C year BP}$  (Dyke 2005; Ives et al. 2013).

While our knowledge of the Corridor region is imperfect, it does have one advantage over pre-Clovis and Clovis era sites to the south. Virtually all researchers accept that deglaciation and ecesis had to occur before human populations could re-enter this region. Therefore, we can be confident that *de novo* colonization events did take place in late glacial and early Holocene time in the Corridor—whereas we are less certain about the precise relationship among early sites and populations south of the ice masses. We have good reason to think that human populations in Beringia and south of the ice masses *resumed* contact with each other during this recolonization process, a scenario of considerable human interest.

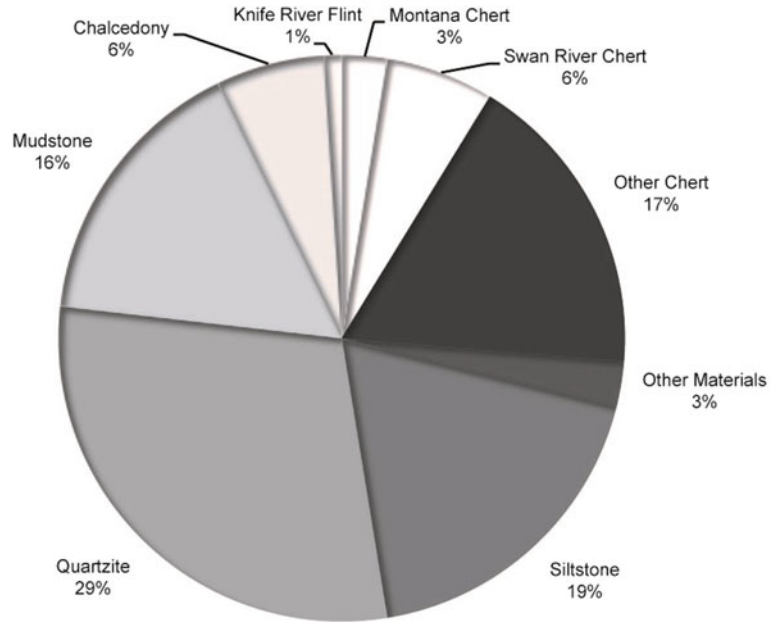
### 10.6.1 *Lithic Raw Material Use for Fluted Points in the Corridor*

Fluted points are a reliable indicator of at least one component of the early archaeological record of the Corridor region. Though lightly studied, it is erroneous to assume that there is scant evidence for human habitation of the deglaciating Corridor region, as Fig. 10.4 shows. In the North American scheme of things (with reference to the *Paleoindian Database of the Americas* evidence), fluted points are moderately common in western Canada. If we accept the several limitations of this record, it is possible to dredge some meaningful conclusions from the fluted point data.

The Alberta sample of fluted points contains some instances of “classic” Clovis and Folsom materials. These instances are in a minority, however, as most Alberta fluted points are short, broken, or have definitive signs of reworking and may be basally thinned or multiply fluted (Ives 2006; Ives et al. 2013). While some fluted points occur in archaeologically rich but poorly stratified sites occupied throughout the Holocene (such that it is difficult to know precisely what accompanying assemblage there was and whether a more significant residential encampment was involved in this early time range), many fluted points tend to occur as isolated finds, or very small clusters. These points at the end of their use life generally occur in landform settings that might also be termed “tertiary” with respect to human use—various forms of moraine, the shorelines, or more commonly the floors of proglacial lakes, and some high vantage points (Ives 2006; Ives et al. 2013). They do not appear to reflect large kill sites or major camp or residential settings (which are more likely to be obscured by those same dynamic geological processes or by being parts of the large, artifact-rich and yet poorly stratified sites noted above).

While it is reasonable to suppose the classic Clovis and Folsom instances are contemporaneous with southerly instances, the age of the short “atypical” fluted points is widely assumed but in reality

**Fig. 10.5** Fluted points in Alberta are dominated by locally available raw materials, with only rare instances of Knife River Flint or Montana chert



poorly understood: one of these points was found in deposits averaging ca. 10,500  $^{14}\text{C}$  year BP in Charlie Lake Cave, leading to the conclusion that they are post-Clovis and roughly Folsom (ca. 10,800–10,000  $^{14}\text{C}$  year BP) contemporaneous. A single averaged instance gives us little to go on in evaluating the age of the atypical fluted points, particularly when the variant forms we find in Alberta very closely resemble resharpened specimens in well-defined Clovis circumstances, such as those of the San Pedro valley in Arizona or at Blackwater Draw (cf. Ives et al. 2013). However we view them, the fluted points from Alberta reflect the most reliable body of information we have about the earliest or at least one of the earliest infiltrations of the deglaciating Corridor region.<sup>6</sup>

The toolstone from which the fluted points were made can tell us something about where these populations lived, or how they interacted with other populations. Figure 10.5 (see also Ives et al. 2013) illustrates that for the 183 instances of Alberta fluted points where we have both reliable raw material identification and a plotted find spot, the point assemblage is made almost entirely from widespread, locally available materials, especially quartzites, mudstones, and siltstones (see examples in Fig. 10.6). One caveat should be registered. Some fluted points are identified as “Montana” chert; use of Montana cherts does occur throughout southern Alberta prehistory, so that it is debatable whether Alberta points found just to the north of the 49th parallel truly are being made of an “exotic” raw material. Consequently, “exotic” raw materials for fluted points in Alberta are in the 1–3 % range (Ives 2006; Ives et al. 2013). With a somewhat smaller database, Gryba (2001) put the

<sup>6</sup>Some Chindadrn-like and Sluiceway-like points have been found in Alberta, but none in circumstances that can be dated; consequently, there are no assemblages or diagnostics known to be contemporaneous with Clovis but having links to the north. Microblades do occur at various sites throughout the province, and while some of these are mid-Holocene age and younger, some are likely to be relatively ancient (Fedje et al. 1995; Wilson et al. 2011). The Component II Dry Creek materials contain similar microcores along with distinctive, thick, heavily resharpened oblan-ceolate points or knives. These last artifacts do occur in both northern and southern Alberta, and might speak to a northern presence in the Corridor region as early as ca. 9,800–10,500  $^{14}\text{C}$  year BP (Ives 1993). That an even earlier northern presence in the Corridor region is difficult to affirm at the moment should in no way be taken to mean it could not easily be so (cf. Landals 2008).





**Fig. 10.6** Fluted points made from raw materials found in western Canada: (a) from the Bashaw, Alberta area, a red mudstone with Red Deer River sources; (b) from Pridis, Alberta, a mottled pyrometamorphic common in central Alberta Paleoindian materials; (c) fine black chert from the Peace River country of northwestern Alberta, in a point from the Eaglesham area (note the similarity to Alaskan forms); (d) a siltstone used in a point from the Brooksby area of northeastern Saskatchewan; (e) a “classic” Clovis point found at 2,300 m elevation in the Clearwater Pass, Banff National Park, Alberta, made of material from a heat-treated concretion (Gryba, pers. comm.). The Pridis point (b) photographed courtesy the Royal Alberta Museum; (d) photographed courtesy David Meyer (University of Saskatchewan); (e) courtesy Parks Canada

figure for exotics at 4 % for small, basally thinned points and 7 % for larger Clovis points in Alberta. However we categorize these findings, they are in decided contrast to fluted point instances south of the ice masses. High proportions of projectile points made from “exotic” and aesthetically appealing toolstones that routinely came from sources 200 to 600 or more km distant are the *sine qua non* of fluted point assemblages in the lower 48 states (see Meltzer 2009 and Haynes 2002 for summaries of this widespread pattern).

The other reliably identified exotic toolstone in Alberta is Knife River Flint (KRF), a silicified lignite containing plant macrofossils, with well-known sources in North Dakota (Clayton et al. 1970). KRF has a far-flung distribution in North America, a phenomenon Tankersley (1991) applied in assessing whether exotic toolstone use by Clovis populations indicated that they were engaged in colonization as opposed to extensive trade of raw materials. Intriguingly, Clovis points of KRF occur as much as 1,500 km south of the North Dakota source region. Tankersley felt that this very long distance directionality revealed movement away from the Corridor region consistent with colonization activity. KRF is present among Saskatchewan fluted points (Kehoe 1966). There, it comprises half of Clovis and Folsom points (Hall 2009). A significant area of southern Saskatchewan nevertheless lies within a 250–300 km radius of the North Dakota sources for KRF, so that such usage could be attributed to annual range mobility of foraging groups in the vicinity of the 49th parallel. At greater distances in central Saskatchewan (on the order of 600–800 km), fluted points are again comprised of locally available raw materials, such as siltstones and Swan River Chert (Meyer et al. 2012). When KRF is found in Alberta, its presence is another matter altogether, because its Paleoindian occurrences are 800–1,600 km from the source, a distance that cannot readily be accounted for by high rates of logistical or residential mobility. Figure 10.7 shows two exceptions to this fluted point pattern for Alberta, one of these being a KRF point from central Alberta, and the other (the Foss point) made of





**Fig. 10.7** Two points that are the exception to the normal pattern for fluted points in Alberta: (a) a Knife River Flint Clovis point from central Alberta (photograph courtesy of the Royal Alberta Museum), and (b) the Foss Point, likely made from a Montana chert, but found in the Cold Lake area of east central Alberta. Both of these raw materials would be more than 700 km from their source area, whereas the vast majority of Alberta fluted points are made from locally available toolstone

what appears to be a Montana chert, but recovered some 700–800 km to the north in the vicinity of Cold Lake Alberta.

### 10.6.2 *Lithic Raw Material Use by Cody Complex Times*

If we shift to the opposite end of the Paleoindian time frame, we see that a dramatic change takes place for the large sample of Cody Complex materials (nearly 900 Alberta, Scottsbluff, and Eden points as well as distinctive Cody knives) that Dawe (2013) has documented for Alberta. For the 475 instances where there is reliable raw material data, all Cody materials average 28.2 % KRF, with some categories (Alberta points and Cody Knives) exceeding 40 % KRF (see also Knell and Muñiz 2013; Root et al. 2013). In certain respects, it could be argued that the Cody Complex echoes some important trends first evident in the fluted point era, a focus upon exotic raw materials for weaponry, extraordinarily high degrees of skill in executing lithic technology, and retention of an elegant bone and antler technology are among them (Ives et al. 2014; Knell and Muñiz 2013).

In most western Canadian cases, we have no detailed information on associated assemblage characteristics, but Tolman (2001) described a cache of St. Mary Reservoir materials, containing two Alberta points, where most of the associated scrapers and large flakes were also KRF. This cache is more than 800 km away from the KRF sources; the Alberta and Scottsbluff points from the greater Edmonton region illustrated in Fig. 10.8 are more than 1,000 km away from the KRF sources; Peace River instances of Cody Complex KRF are at a distance of 1,500 km or more from the source area. These distances far exceed any ready conception of ethnographically typical foraging radiuses. If we plot density isopleths of the Alberta Cody Complex in a fashion analogous to that for fluted points, we see two things: an intensification of finds in areas where fluted points were previously common, and a “chaining” together of these denser clusters (Fig. 10.9).



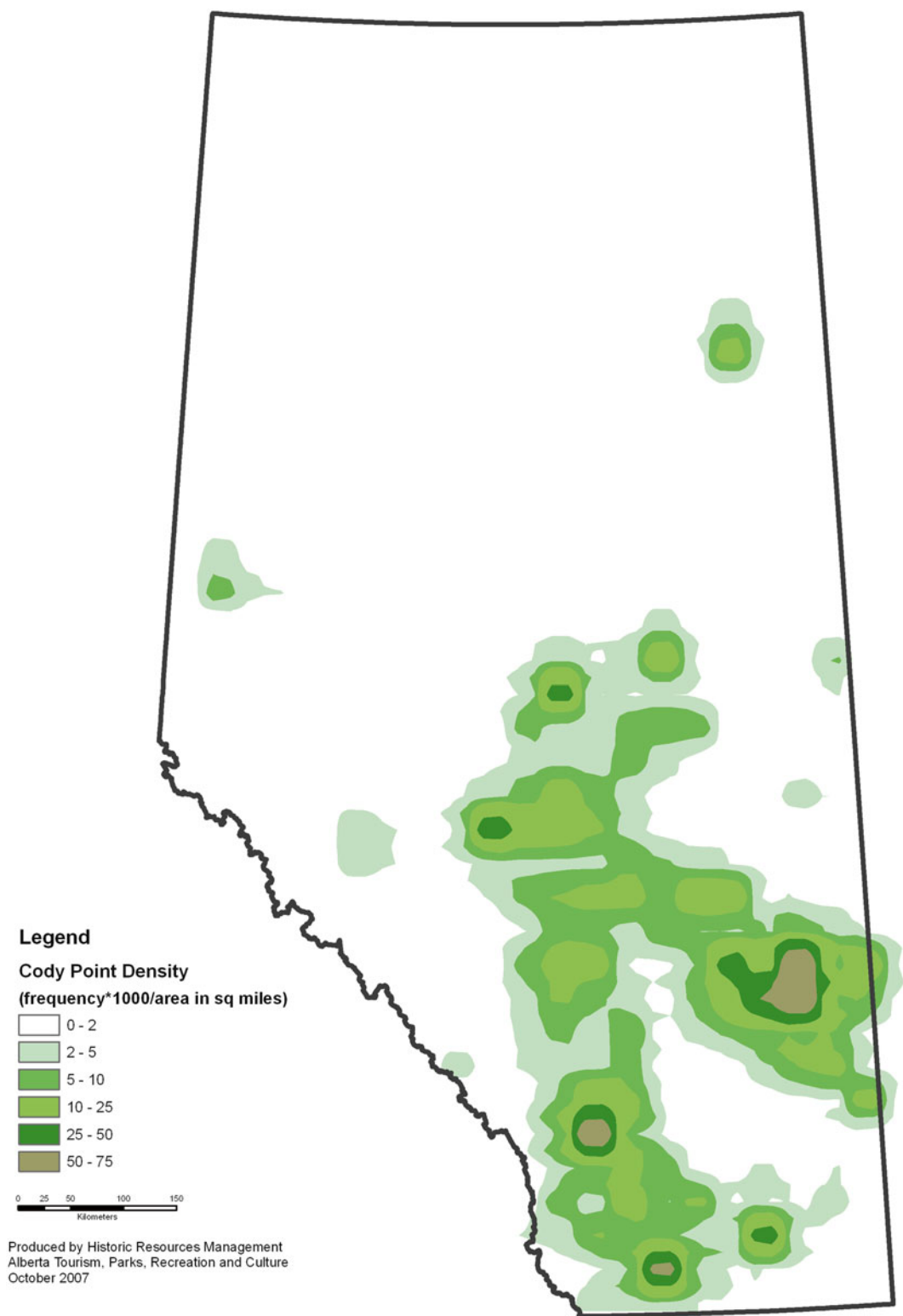
**Fig. 10.8** Cody Complex points made of Knife River Flint, recovered from: (a–d) the greater Edmonton region in central Alberta, more than 1,000 km from the North Dakota sources; (e) Luseland, Saskatchewan, more than 700 km from the North Dakota sources; (f) northwestern Alberta’s Peace River country, more than 1,500 km in a direct line from the North Dakota sources. Photographs (a–d, f) taken courtesy of the Royal Alberta Museum and the Archaeological Survey of Alberta

This Cody Complex scenario is an intriguing contrast with Paleoindian assemblages to the south. There, by the later part of the fluted point era, we typically see signs of regionalized stylistic variability, economic activity, and more sharply circumscribed lithic conveyancing (Meltzer 2002; Ellis 2011 provides an excellent example). The broader Corridor region thus provides distinctive evidence of another trend in lithic conveyancing that runs counter to the larger North American picture.

### 10.6.3 Explaining Toolstone Use in the Corridor Region

What then might lie behind this? First, it is important to take cognizance of the data in question: we are speaking here of projectile points only, and not entire lithic assemblages, which in many cases do not parallel the raw material trend for the points themselves. Archaeologists have been—for valid reasons—fascinated by Paleoindian projectile points; it is only comparatively recently, however, that there has been more overt recognition that this is a special category of material culture that by all signs was heavily valorized by Paleoindian societies themselves, whose members clearly went to great lengths to acquire unusually beautiful toolstone and then proceeded to manufacture elegant weaponry that went far beyond rudimentary functional requirements (Bamforth 2009; Speth et al. 2013).

In their influential “Coming into the Country” article, Kelly and Todd (1988) crystallized a series of concise, testable propositions about Paleoindian economies and mobility. They suggested that Paleoindian populations could be termed “high technology foragers” who favored extraordinary residential and logistical mobility in their use of a largely unpeopled landscape. One focus of their attention lay with the use of “exotic,” high quality toolstone. In a great deal of subsequent literature, the large distances between many Paleoindian sites and sources for the lithics within them became a virtual index for some subsistence settlement dimension of annual mobility (whether this involved residential moves, logistical provisioning, or both factors playing out through time in low population density



**Fig. 10.9** Density of Cody Complex artifacts in Alberta, plotted in the same fashion as the Alberta fluted points in Fig. 10.4, with data as described in Dawe (2013)

settings). In his carefully reasoned article concerning Paleoindian use of raw stone materials in north-eastern North America, Ellis (2011) provided detailed support for the perspective that Paleoindian societies had unusually high rates of annual mobility, moving over seasonal ranges only approached by recent caribou hunting societies in northern Canada.

That acknowledged, however, there are just a few instances above 400 km in Ellis's early fluted point era toolstone procurement data, and none above 300 km for the later Paleoindian materials, with both data sets averaging less than 200 km. For the KRF information in western Canada and extending into eastern North America, we are speaking of exotic raw material transport virtually an order of magnitude greater. Bamforth (2009) and Speth et al. (2013) argued for a shift in interpretation that places much less emphasis upon "embedded" lithic procurement as an adjunct of more purely economic and technological activity and much greater emphasis on the social dimension of exotic lithic procurement, including that for projectile points. Along with notions of "costly signaling" and attention to the symbolic significance of the points themselves, these authors suggest other explanations, including trade and what might be referred to as "ceremonial" provisioning of special raw material substances. These explanations rely more heavily on the social context of interactions as would certainly seem required for the KRF case.

With these notions in mind then, we can consider how we might apply our thought model precepts to the western Canadian Paleoindian data, which trends in the opposite direction to much of the rest of North America. It has become increasingly common to infer that the fluted point occupation of the deglaciating Corridor region originated with populations to the south. If we examine this proposition from the more synchronic perspective of a functioning subsistence settlement system, albeit one that may have featured extraordinary mobility, one might project that an occupation would begin with periods of seasonal use from points to the south as conditions in the Corridor ameliorated. There would be regular returns to southern locales, followed ultimately by a permanent shift in range occupancy to the north. One would predict a certain degree of "founder effect" for raw stone materials that would come from the northern tier of the United States. In Alberta, these lithics would appear as the "exotics," very common throughout the Clovis world and could be expected to reflect Madison Group cherts, KRF, various Idaho and Montana obsidians, and other well-known raw materials.

Yet, this is not at all what we see: if such a founder effect took place, it was submerged almost entirely by subsequent fluted point occupation. Other explanations are more likely. It could be that the direction of colonization was actually from the north, with the implication that fluting technology may have emerged in eastern Beringia or in the Corridor itself (e.g., Buchanan and Collard 2007, 2008; Buchanan and Hamilton 2009). With fluted points in Alaska now being more reliably dated to the post-Clovis Younger Dryas interval, the origins of fluting technology nevertheless seem likely to lie to the south. Two other explanations consistent with a diachronic view of kin-structured principles of group formation seem more plausible. One would be that the initial fluted point population established in the Corridor region (from the south) was comprised of a few predominantly endogamous daughter groups that quickly became isolated and heavily reliant on local raw materials. A second notion would be that fluting technology spreads to a pre-existing local population, again of northern origin, that was already familiar with local toolstone sources (cf. Beck and Jones 2010). In either case, the *sine qua non* of these populations would be a significant degree of isolation—with neither travel, trade, nor high rates of mobility introducing exotics as was so common elsewhere at this time.

Our current information for Alberta is too weak for us to be certain if these trends were shifting by Folsom and Agate Basin times (ca. 10,800–10,000 <sup>14</sup>C year BP)—the limited data suggest that a nearly exclusive reliance on locally available raw materials continued (Benders 2010; Ives 2006). However that may be, there is clearly a documented shift with the onset of the Cody Complex: KRF regularly dominates the projectile point assemblage. There is also a significant increase in the frequency of Cody Complex materials on the landscape. A millennium and likely more after the waning of fluted point technology, it is in no way unreasonable to think that human population densities were indeed greater. Movement of KRF across this Cody Complex landscape was almost certainly subject to a greater degree of social mediation, in one form or another: these populations were *not* isolated from

each other. One can envision many specific ways in which this raw material moved, including various forms of trade (“down-the-line,” trading partnerships, redistributive loci), gaming, or “epic” voyaging through occupied areas to provide direct access to distant KRF sources. Such interaction would of course be promoted by an expansive social outlook, in which exogamy featured prominently, and a vast web of kin ties, such as we see among Mackenzie Basin Dene, would be an underlying means through which this pattern could emerge.

To articulate a larger picture influenced by the thought model developed here then, there are reasonable grounds for arguing that an initial phase of settlement in the Americas took place as the consequence of small groups applying Local Group Growth principles in efforts to maximize their capacity to access spouses for the intergenerational perpetuation of their groups. Some groups failed, some persisted for a while but not indefinitely, and some overcame the demographic threshold at which populations were securely established. It is not difficult to imagine the Gault locality sites in Texas as one such locus (intriguingly, with a strong predilection for locally available Edwards chert), in which a viable population nucleus was established. From parent groups like this, small groups fissioned and were inclined to make directed, long distance moves consistent with a “leap frog” mode of settlement. In line with Steele’s modeling, it could be that the discontinuous, patchy pattern in fluted point distribution revealed by the *Paleoindian Database of the Americas* is a lingering signature of this initial colonization; although by the dawning of the fluted point era, change was afoot. As measured by lithic conveyancing, this one index would suggest that substantial, social interaction was taking place over great distances by Clovis times. This, and the rapid spread of fluting technology itself, may very well be indicative of a broad pattern in which originally Local Group Growth systems tended to give way to Local Group Alliance systems, as human population densities rose and infilling among settlement nuclei continued (cf. Tolan-Smith 2003 on the late glacial re-occupation of Great Britain). Such trends were not uniform in either time or space. The record for the Corridor region would suggest that early populations there were isolated from these broader trends, either because they were founded from the south and once in place remained more internally focused for a time, or because they were northern populations receiving fluted point technology that would then be transmitted along a gradient running through the Peace River country and into eastern Beringia. A second phase of the Paleoindian settlement process saw extensive socially mediated communication taking place in a broad zone extending diagonally from the Peace River country, along the southern shore of Glacial Lake Agassiz.

## 10.7 Conclusions

In a sophisticated modeling effort (use of Lévy flight patterns to explain hunter-gatherer foraging mobility), Brown et al. (2007) wrote that “One should first conceptualize the social model and then evaluate its quantitative implications.” I am obviously in agreement with their position and strongly advocate a return to basic anthropological principles that once generated so much influential theory. Fortunately, there seems to be increasing interest in the human dimension of this early time frame, being expressed in notions like a Paleoindian “social landscape.” In pursuits like Paleoindian conveyancing of exotic lithics, investigators are now contemplating ideas like ceremonial provisioning, epic journeying as rites of passage, trading partnerships, or the wide circulation of specialized lithic craftspersons. Bradley and Collins (2013) have even made a carefully conceived proposal that the Clovis phenomenon be considered as a cultural revitalization movement. These are all fundamentally social conceptions, breaking away from the strictures of settlement processes regarded as essentially biological in character and arising from simple “waves of advance” or demic expansions of early populations.

Encouraging though these more socially imaginative proposals about the Paleoindian world are, it is difficult to know which, if any, of the specific ideas noted above (from revitalization movements to



ceremonial provisioning) might have existed in such a deep past. While it is equally difficult to contemplate what kinds of kin systems might have prevailed in Paleoindian settings, kinship is a constant in human societies in a way that other phenomena simply are not. In fact, for all of these other social alternatives, one would fully expect kin conceptions (real or fictive) to have inflected the social settings in some fashion. Of all the more socially oriented explanatory options before us, it is arguably kinship that deserves a greater share of our attention.

Rather than imposing models with cross-culturally derived “average” kin concepts that fail to account for the real world variability that accompanies all kin systems, I have suggested that we engage in some theory building relevant to the elementary kin structures typical of band or hunter-gatherer societies. The particular instance we have considered here—with models arising from North American language families where Dravidian or Dravidian-like cross-parallel distinctions are made in kin terms—has a semantic framework that could plausibly lie at the historical root of many New World kin systems. In adopting this perspective, we follow the lead of knowledgeable persons in hunter-gatherer societies who use kinship as the idiom in which principles of group formation are typically expressed; we find that different strategies for group forming principles arising from this semantic framework trigger different developmental processes through elapsing generations. Those developmental processes impact society, polity, and economy, with empirical traces for material culture that can be tracked in the archaeological record, including the circumstances surrounding human migrations.

Logically, the historical trajectory for New World demography extended from a period in which the earliest First Nations ancestors entered a completely vacant landscape through to one which, by later Paleoindian times, involved greater population densities. Whether or not one accepts the specific line of argument offered here, there should be no doubt that Paleoindian populations must have made vital, conscious decisions about marriage and alliance strategies in managing dynamically fluctuating terminal Pleistocene environments and the emerging social landscapes that followed. By drawing attention to kin principles, we bring into sharper focus pivotal choices involving comparative degrees of residential group exogamy that any colonizing group would face. At extremely low population densities, precepts favoring endogamy would have advantages in retaining potential spouses within a group. The primary disadvantage for such groups would lie in exposure to stochastic processes that can end a small group’s survival. This line of thought resonates with our current impression of a few widely separated population nuclei scattered across the Americas, raising also the seldom-expressed idea that not every colonization process will be successful. The patchy distribution of fluted points in North America as an after effect of such an initial strategy is equally provocative food for thought in this respect (cf. Anderson and Gillam 2000; Meltzer 2002).

Where there was a stress on co-resident group exogamy, local groups would be required to seek spouses in surrounding groups. In terms of late Pleistocene geography, this strategy could be expected to yield a “string or pearls” migration pattern, though one would predict more continuous temporal and latitudinal gradients for early sites (something that does not at the moment appear to be a characteristic of the early New World archaeological record). More exogamous strategies were more likely to have thrived with higher population densities, but wherever they occurred, they would be especially effective in creating broad webs of kin relationships. For decades, Clovis was viewed as a colonizing population with success driven in an uncomplicated fashion by large mammal hunting and expanding populations. Today, it appears that Clovis is a successor population, and that the fluted point phenomenon may in important ways be a social expression of Paleoindian societies “opening outward” after a point of demographic “take-off” in the New World (cf. Meltzer 2002:40). An exogamous stance would greatly facilitate social transmission of ideas that could include the unusual but widespread technological innovation of fluting itself. This would in no way be inimical to a number of the other cultural explanations for exotic lithic conveyancing noted above.

With respect to the more specific regional problem examined here, the Ice Free Corridor has almost invariably been seen as a simple migration pathway. By injecting kin conceptions related to how the deglaciated Corridor region might have been settled, meaningful information for even this rather



recalcitrant archaeological record can be marshaled. Toolstone use for fluted points inside the Corridor runs against the grain of our understanding for most of North America, where exotic raw materials circulated widely. Almost exclusive reliance upon local raw materials inside the Corridor would suggest either the comparative social isolation of colonizing fluted point populations arriving from the south, the transmission of the fluting concept among pre-existing populations that had arrived from eastern Beringia after deglaciation began, or both. The second and third alternatives—stimulated by considerations arising from the thought model—have not been clearly expressed before, but may well provide the most fruitful line of enquiry, given the established temporal cline for fluted point sites in southern Alberta (such as Wally’s Beach), the Peace River country of northeastern British Columbia and northwestern Alberta (particularly Charlie Lake Cave), and now, well-dated sites in Alaska (Raven Bluff and Serpentine Hot Springs). Very different conditions prevailed for exotic toolstone use by Cody Complex times, with KRF moving over vast distances far exceeding normal conceptions of hunter-gatherer annual or even long-term ranges. Again, some type of social mechanism involving the wide circulation of individuals seems to have been at work: an exogamous marriage network analogous to those that we find across the Mackenzie Basin would certainly facilitate such a pattern.

Finally, I would observe that the Local Group Growth and Local Group Alliance frameworks are generative models for which increasingly refined archaeological test implications can be developed. The caliber of Paleoindian databases has grown significantly in recent years, with admirable efforts toward “chronological hygiene,” high precision methodologies, and continuing advances in the study of modern and ancient DNA (aDNA). It is quite conceivable that aDNA results (particularly for autosomal aDNA) will significantly impact our understanding even of Middle Paleolithic hominin societies. Complete genomes for both the Mal’ta child and the Anzick child, both of direct relevance to early populations in North America, have been published within the past year, for example (Raghavan et al. 2014; Rasmussen et al. 2014). Recent literature is becoming ever more precise in suggesting how closely related individuals in ancient populations may have been (e.g., Keyser-Tracqui et al. 2003; Lalueza-Fox et al. 2011; Prüfer et al. 2013). While this is not the same thing as understanding an ancient kin system, such findings do have a direct bearing on our grasp of the continuum running from endogamy to exogamy. As more information like this emerges, test implications for prehistoric marriage practices and the composition of co-resident groups will come under anthropological scrutiny, something for which we will surely require kin-based models.

As we shift to an era in which large populations of AMS radiocarbon dates can become data sources in their own right, it will be intriguing to ask precisely how episodic the mammoth hunting in the San Pedro Valley, Arizona, or Colby, Wyoming, regions actually was with respect to elapsing human generations? Might it have resulted from longer-term seasonal exploitation by aggregating local groups or did it result from intensive exploitation by an expanding local group over one or a very few human generations? Similarly, relative endogamy or exogamy should have important implications for prospects of cultural drift, not just with respect to fluted point morphological variability (as discussed above with respect to the Colby site and the Fenn Cache), but in connection with lithic reduction trajectories. Although there are some constraints regarding site ages and function, Smallwood (2012) documents a pattern of dispersal staging areas and variation in biface technology among fluted point assemblages in the southeastern United States for which the thought model provisions are equally applicable. Finally, we might ask if a kinship perspective could suggest something about the social relationships among the experienced practitioners and surrounding neophytes in the blade-manufacturing scenario Lohse (2010) envisioned at Gault (with its implications for intergenerational skill transmission)? In each of these cases, increasingly high quality data sets may eventually be matched with more precise, testable model provisions.

The value of the thought model articulated here thus lies not in the certainty that it is correct in all its details, but rather, in the hope that others may find it useful in understanding the articulation of some key variables that we can be confident truly were important to Paleoindian societies.

**Acknowledgments** I am grateful to H.E. Mr. Olzhas Suleimenov, Ambassador to the Permanent Delegation of the Republic of Kazakhstan to UNESCO and the Embassy of the Republic of Kazakhstan to the United States of America for their kind invitation to take part in the *Second International Conference on Great Migrations: from Asia to America*. I extend my thanks to Aiyem Zholdasbekova, Nurzhan Aitmakhanov, and Nurgali Arystanov for their assistance in arrangements, to Alan Timberlake for shepherding the conference, and to Michael Frachetti and Robert Spengler for guiding this publication. Kisha Supernant constructed the fluted point density map and Michael Semenchuk, the Cody Complex density map; Michael Billinger and Jason Gillespie helped in assembling and organizing ongoing versions of the *Western Canadian Fluted Points Data Base* applied here; Robert Dawe and Jack Brink (Royal Alberta Museum), Todd Kristensen (Archaeological Survey of Alberta), and David Meyer (University of Saskatchewan) provided valuable information on both fluted points and Cody Complex materials. We are all indebted to Eugene Gryba for his pioneering efforts to document fluted points in Alberta. Sunday Eiselt and I presented a related version of this paper at the 2011 of the Society for American Archaeology meetings in Sacramento as well as a poster at the Paleoamerican Odyssey conference in Santa Fe in October 2013; I thank Sunday for her contributions to this work. Columbia University and the Harriman Institute provided a delightful setting for the conference; given this context, I would like to stress that I owe much in my apprehension of Dene kinship to University of Alberta Emeritus Professor Michael Asch, a Columbia graduate who went on to become one of Canada's most distinguished anthropologists of recent years.

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# Chapter 11

## The Problem of the Settlement of the Americas: Old and New Objectives and Approaches

Galina Ershova

### 11.1 Introduction

The problem of the driving forces behind the “Great Migration” has led to many unanswered research issues: this topic of study has developed a complex historiography of its own; identification of genetic and cultural belonging of the early migrant groups is scarce; how they formed a new cultural space with the pioneering of new territories is not understood; nor do we understand much about how their languages and communication developed; how they developed new technologies and innovations in practice; or how they constructed artificial habitats (architectural and ecological). Finally, there is the problem of integral development of and anthroposystem and integration in it of new experiences of passive and active adaptation technologies. In this chapter, I will briefly discuss the historiography of the problem and then present a novel anthroposystemic model for analysis.

Migration and especially the Great Migration is a mechanism of “building bridges” between regions, territories, ethnic groups, and cultures. The earliest population of the Americas is of particular interest for the understanding of these processes, in conjunction with the consideration of a long historical and geographical isolation of the New World, allowing researchers to develop models for early modern human (*Homo sapiens*) adaptations to harsh environmental conditions.

As an inter- and multidisciplinary problem, research into the peopling of the New World requires the involvement of different scientific fields: geography; paleoclimatology; soil studies; anthropology; psychophysiology; genetics; paleopsychology; linguistics; history; etc. The historiography of the problem shows that various researchers attempted to solve it by employing all of these different approaches in the past. Unfortunately, *direct* archaeological data has been insufficient due to the simple fact that the further back in time we look, the smaller the percentage of remaining material traces of culture archaeologists find (especially organic remains).

It is logical to assume that the lack of traces of humans from this time period does not mean that they never existed. In this case, we must implement a research model, based on different types of “non-archaeological” reconstruction. That is why researchers have always addressed and continue to address methods that utilize modern data sets as ethnographic analogies, such as linguistic analysis, historical comparative analysis, and comparative studies of spiritual concepts, traditional ecological knowledge systems, and ethnohistoric comparisons of technologies in small-scale societies.

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Anthropometric (paleoanthropology) analysis was actively and very successfully launched in the middle of twentieth century. Over the past couple decades, a special place has been given to genetic analysis (archaeogenetics), allowing the reconstruction of ancient processes for which there are no other material or spiritual–cultural evidence.

Thus, the problem of migration and the settling of the Americas rests on the need for an interdisciplinary method that incorporates the totality of data available. In addition, the settlement of the Americas is of particular interest for understanding the processes and speed of the development of civilization as a whole, specifically because of the long cultural and geographical isolation of the Western Hemisphere from the great Eurasian supercontinent.

## 11.2 The Problem of Material Evidence

One of the main research limitations in the study of the settlement of the Americas remains the small amount of material evidence. Very few ancient backbones (vertebrae) have ever been recovered, and even (seemingly obvious) traces of human activities, such as lithics, are subjected to constant criticism.

The number of Mousterian period burials in the whole world (Eurasia, North Africa, and southwest Asia), without entering into discussions on hominin species affiliation, their total number barely sums to three dozen. What's more, each of them contains from one to several vertebrae in varying states of preservation (totaling less than a hundred).

However, this does not mean that this huge territory was inhabited by a small population. Smirnov (1991:9–13) presented calculations showing that for the last 55,000 years of the Mousterian period (from 90,000 to 35,000–33,000 years BP), “there is an average of one buried per the Millennium!”<sup>1</sup> Sometimes a skeleton is represented by only one tooth or a single bone. It is quite obvious that this is only a minimal fraction of the former hominin population of the Old World. It is important to take into consideration that the discovered burials of this time period are often attributable to intentional ritual internment, that is, the body was protected from predators and other animals. However, the safety of the body depended on various taphonomic factors, such as the impact of soil chemistry, burial depth, and bioturbation, as well as possible anthropogenic factors, for example, exhuming a body for ritual veneration or defilement, or anthropophagy before burial (Smirnov 1991:49).

If we consider the global data from the Upper Paleolithic, including that from the Americas, the picture looks more plentiful; there are thousands of known sites registered and several hundred skeletons. However, in any case, the known traces of humanity for this period are relatively rare as well.

In the New World, the situation looks even more paradoxical. Several early dated for human remains have been presented over the past several decades, such as a skull from Otavalo, Ecuador, originally dated to 28,000 BP. However, as is discussed in the previous chapters in this volume, early dates from the Americas, such as the Otavalo skull, are rarely accepted by the general academic community. A series of follow-up studies on the Otavalo skull (notably a better dating in 1992 by Joseph Powell) have shown it to be roughly 2,300 years old, and carbon isotope studies on the skull show that he had lived on a diet almost completely dominated by maize (Powell 2005; Salomon and Schwartz 1999). Nonetheless, the fact that such published dates exist and continue to be presented is testament to how complex and poorly understood the process of the peopling of the New World is, and that is why the panorama of settlement of the Americas remains extremely vague (Davies 1978).

Valery Alekseev rightly noted:

Despite the huge scale of search operation in different countries over the last decades, the finds of the Paleolithic hominids are still comparatively rare. Findings of Lower Paleolithic hominids are known mainly outside Europe, middle Paleolithic—mostly in Europe. The locations of the Lower Paleolithic humans are separated from one another by many thousands of kilometers, in Europe the distances between Middle Paleolithic locations average

<sup>1</sup> Note that all translations of quotes from Russian to English were conducted by the author.

to many hundreds of kilometers. Finds, as a rule, are represented by single skulls, and in the vast majority of cases are extremely fragmented. All these problems limit the potential of population and racial reconstruction by only more or less verisimilar reasons, and are not free from subjective impressions of the researcher. There are more findings of Upper Paleolithic hominids, they are concentrated mostly in Europe; although, they are registered in other continents too [Alekseev 1978:13–15; translated by the author].

Alekseev (1978) connects this situation in particular with the fact that in Europe the study of Paleolithic remains has existed much longer than in other parts of the world, and he arrives at the conclusion that “the geography of the findings do not reflect the dimensions of Paleolithic ecumene,” due to the accidental character of the Paleolithic findings (Alekseev 1978:16).

### 11.3 Methods for Calculating the Ancient Population

Numerous attempts at approximating the ancient human population size during the early migration process have been made. However, they differ significantly. There are estimates that suggest only 91,000 people lived on Earth 42,000 years BP and by 17,000 years BP—3,000,000 people. According to one estimate, the human population on Earth grew from 10 to 50 million during the Neolithic, while the approximate population density in certain hospitable regions may have reached 350 people per km<sup>2</sup> (Prohorov 1994:53). Supporters of a more moderate estimate support a number of 8–12 million people by the end of the Neolithic. According to McClellan’s data, the population density in the Lower Paleolithic did not exceed 1 person per km<sup>2</sup> (McClellan 2006).

However, as a rule, any of these figures are still highly speculative and remain conditional estimates. The issue is that the basis for these calculations is often the same highly fragmentary and nonrepresentative archaeological material (traces of dwellings, beads, middens, etc.). While the archaeological integrity of these objects increases closer to the Neolithic, for earlier periods it is not sufficiently representative.

It is necessary to add that during the analysis of the human remains intentionality of the human internment is not discussed; furthermore, there are simply too few burials from the Mousterian and Upper Paleolithic to construct a total population estimate. These periods are also connected with an intensively debated topic—was there contact between Neanderthals and anatomically modern humans. Paleodietary studies identify some of the mechanisms determining the settlement of human groups in Europe in the Late Pleistocene, which was largely determined by the distribution of food resources. Kozlovskaya (2000:411–420) formulated the hypothesis that the expansion of important food sources stimulated not only the spread and adaptation of people into new ecological zones, but also the formation of new demographic structures.

### 11.4 Migration: Where and What for?

While most researchers agree that sedentary agricultural populations have the capacity to grow at a more rapid rate than mobile pastoral or hunter/gatherer populations, it is the latter of these two groups that tend to be associated with large-scale migrations. Therefore, it is interesting to note that two of the crucial motivating factors for the movement of large masses of people (leaving political factors aside), overpopulation and the need of large free areas for the subsistence economy, are of greater concern to agricultural communities. The great global migrations in the Upper Paleolithic, when people began to populate the northern territories, required mastering the most diverse, and in many cases harshest, climatic zones in the world. It seems unlikely that humans would move into these regions without motivating factors, such as overcrowding or overexploitation of natural resources. What factors led early humans to settle in areas like the frozen tundra (e.g., Kolyma and Chukotka),

high mountain regions (e.g., the Caucasus and Pamir), and desert regions (e.g., Northern Africa and Central Asia). However, Bryan (1984:98) ingeniously suggested that the fear of cold is “invented by the inhabitants of the middle latitudes.”

It is also interesting to note that regionally specific distinct human physiological characteristics started to form in the Upper Paleolithic. After millennia of population isolation, these characteristics would eventually lead to the regionally prescribed racial groups we see around the world today. Thus, we can assume that between the main settlement centers of these migrations there were buffer zones, areas across which people did not interact (or had limited interaction). These zones could have formed as a result of natural geographic barriers (e.g., mountains, water, or deserts). But also it is possible to assume that the migrating populations had moved a far enough distance from their original source that backcrossing with their root population was not possible (Sergeev 1986:24–26).

If we return to the issue of settlement of the Americas, the natural oceanic barrier, which closed after the end of the Last Glacial Maximum (LGM), made backcrossing with Asian populations impossible. However, one should not forget that the present narrows of the Bering Strait is only 85 km wide, and especially narrow in the winter months. At present the strait is not an obstacle to the occasional contacts between local genetically related populations on either side, as well as for adventurers/explorers. However, modern attempts of the grand re-exploration of Alaska by Eurasia populations from across the strait were not undertaken until the colonies of Russian merchants were settled there in the eighteenth century. In addition, there is evidence of alleged earlier visits to Alaska by Russian expeditions, which in fact is quite logical. However, these early Russian trips were reconnaissance expeditions collecting any possible information and did not result in colonization.

Returning to the main problem of this chapter, the reasons for global migration, why, before the end of the LGM, did migration waves of small groups of hunters and gatherers explore the American continents. This question is especially interesting in light of the fact that during later periods when populations had grown significantly and technology had improved such attempts were not undertaken again.

The debate over when the earliest pioneers made it to the Americas from Asia is still contentious. As already mentioned, few skeletons remain from these early periods in Eurasia, due to the destruction in alkaloid soils, due to human actions like anthropophagy, or due to other anthropogenic factors, including funerary rites, such as exposure, leaving the dead opened on the ground or in the “air” burial, water burial, dissection of the body and the distribution of dissected bones as amulets; cremation; purification of the bones, and leaving them uncovered; grinding the bones of the dead and adding in food; crushing and scattering the bones in the field, etc. Humans have partaken in a diversity of manipulations of dead bodies through time (see Smirnov 1997). In the case of the settlement of the North American continent, there is also a hypothesis that the traces of the earliest human habitation were erased by the submersion of coastal sites by a rising sea level following the LGM (discussed in several proceeding chapters in this volume). It is worth noting that the remaining ancient settlements in northern North America (Old Crow, Kennewick, Calico, Valsequillo, Monte Verde, Cerro Sota, Toca de Boqueira—Pedra Furada, Taima Taima, Meadowcroft) are predominantly located close to the present shoreline (Meltzer 2009:2). Nitrogen isotope  $^{15}\text{N}$  studies of human collagen from bones would help determine the diet and trophic level of these early North Americans, but again, everything rests on the lack of preserved remains (Kozlovskaya 2000).

## 11.5 Dating and Archaeology of the Settlement of the Americas

The dating of the first penetration of North America as based on archaeological data has been heavily debated for decades. The most cautious archaeologists continue to consider a date that does not exceed 14,000 years BP. Although, now few researchers exclude the possibility human occupation before the Clovis culture. However, a few archaeologists are still proposing dates exceeding 35,000 years BP, some assume dates as far back as 40,000–50,000 years BP (Bryan 1978).

Back in the 1980s, Nikolai N. Dikov, who discovered two Paleolithic sites in Kamchatka, Chukotka and Kolyma, came to the assumption that Paleolithic hominins could have been the first to migrate to the Americas and that they were later displaced, destroyed, or assimilated by modern humans (Dikov 1978, 1985)—although there is little data to support this assumption today.

A large number of animal bones with possible processing marks were found at the Old Crow site in Canada, located near the shores of the Arctic Ocean. The radiocarbon dates (although run in the 1980s) suggest dating in the range of 25,000–40,000 years BP. This arctic settlement could be the most ancient in the North American continent (see Morlan 1986), although, understandably, many continue to question the antiquity of the supposed markings.

In the 1980s Nikolay Dikov carried out a comparative analysis of tools of Paleolithic cultures of northeast Asia, Chukotka, and northwest North America (Alaska and Canada) and linked these groups through lithic technology (a similar conclusion is presented in Chap. 5 of this volume). Dikov further argued for a four-stage settlement of the Americas. While the chronology of his system has not held up against modern scientific studies during the past three decades, its merits mention as he was an early supporter of multi-wave settlement models. According to his model, the first “hypothetical,” and not chronologically differentiated, stage of settlement was referred to as “Zyrjanski” the glacial period (70,000–50,000 BP), subsequently followed by “Karghinskiy” or interglacial period (50,000–28,000 years ago). During this stage, he focused on bone tools as characteristic components (Dikov 1985:12). He also noted that the next stage was partly “hypothetical” due to the limited data available in the 1980s—20,000–14,000 years ago is the period of the greatest distribution of glaciers (LGM)—Dikov called it the “Sartan” glaciation (Dikov 1985:14). The third stage, corresponding with early Ushkovsky culture in Kamchatka (petiolar lithic tips) is quite obviously connected to the Paleolithic in America (14,000–13,000 BP) (Dikov 1985:15). The fourth stage comes at the end of the glaciation (12,000–10,000 BP), which is associated with the expansion of the Strait between Chukotka and Alaska, creating a swampy tundra-steppe, reduction of megafauna, and is characterized by a culture of wedge-shaped lithic cores, Denali–Akmak culture, and some other technological elements (Dikov 1985:19–20). Only the last two phases of his chronology seem to hold up at present; however, his system of classifying lithics on either side of the strait is still key for understanding the Great Migration; in addition, his idea of multi-wave colonization is still discussed in the literature (see Chap. 8).

### 11.5.1 *Paleoanthropology*

The academic community’s interest in the origins of American Indians dates back to the eighteenth century. K. Linnaeus and I. Blumenbach expressed doubts over their Asian origins. But, by the early twentieth century an Asian origin was actively supported by Hrdlicka (1907). Although, by comparing the skeletal remains of the people in Mongolia, Tibet, Siberia, Alaska, and Aleutian Islands, he believed that the settlement occurred from East Asia only about 3,000 years ago, across the Bering Strait from Asia.

About the same time doctor Paul Rivet, an anthropologist and a linguist, suggested a multivariable theory of settlement of the Americas. Based on the linguistic and ethnographic data Rivet (1943) proposed that different groups (Asians, Melanesians, and Australians) participated in settling at different periods. Although, since then, this theory has been mostly rejected.

While there has been considerable anthropometric research into the origins of the early Americans (see Zubov 1999:15), practically nothing new has been done in the past few decades; due to the principles of political correctness, most race research programs were abandoned. As we can see in Chap. 8, the emphasis on political correctness has forced us to throw away the baby with the bathwater in the field of craniometrics.

Zubov (1999:42–43) points out a general the homogeneity among Indian population, and he clearly highlighting that Central American groups are different from non-Maya populations (for a more comprehensive summary of morphometrics among human populations in the Americas, see Chap. 8 in this volume).

### 11.5.2 *Archaeogenetics*

Analysis of genetic markers in modern Indian populations helps create a picture of the geographical distribution of haplotypes of immunoglobulins with the areas of settling. Genetic distances of some groups indicates that possible isolation of as much as 15,000 years could exist. A summary of this genetic data, including the most recent accepted results, is presented in Chap. 4 of this volume. Many researchers accept a three-wave model of settlement (see Dumond 2001; Rodríguez 1987; Turner 2005; Williams et al. 1985). Roughly, this three-wave model goes as follows: paleoindians—40,000–16,000 years BP [34,000–17,000 years ago by Schurr et al. (1993)]; the Na-dene group—14,000–12,000 years BP; and the Eskimo–Aleutian group—9,000 years BP. Sukernik et al. (1988) present a two-wave model: paleo-American—20,000 years BP and Na-dene/Eskimo—12,000–11,000 years BP.

Meltzer (1989) proposed the widening wave theory of “drip migration,” which explains many details of movements, including inside the continent. According to Zubov, most genetic clock data suggests dates significantly higher than 13,000–14,000 years BP (2002:396, 397). Although, there have been many highly contentious genetic clock results in genetic-based debate of the peopling of the New World; for example, Hopkins et al. (1982) suggest the possibility of penetration up to 65,000–56,000 years BP.

### 11.5.3 *Linguistics*

For the moment of the discovery of the Americas, the native population was estimated at around 40 million people who spoke almost 2,000 languages (LKKNA 1955:11–12). In 1950 there were registered only 1,600 Indian languages; linguistic studies of American languages began with the description of these languages by the first missionaries in the sixteenth century. In the twentieth century the field of linguistics was founded by researchers, such as P. Rivet, F. Boas, and E. Sapir. There were several basic classifications made by M. Swadesh, J. Greenberg, and N. MacQuown. Knorosov (1999a, b) noted that identification of linguistic material is so complex that there is no “final classification” of linguistic evolution. Since the publication of the volume “Linguistics: Handbook of Middle American Indians” (McQuown 1967), with its extent bibliographic inventory (Bright 1967:9–62), it has become more clear that the integration of Indian languages into broad linguistic families and macro-families does not always imply a genetic relationship among the people who speak them. On the other hand, in many cases there are genetic relationships between the languages and their speakers, especially if they are geographically very distant from each other. There are constant attempts to find a point of connection between American languages and those of the Old World; however, none of these attempts have proven fruitful. Some researchers, including Knorosov, on the basis of analysis of formation of language families are inclined to the dating of the settlement of America closer to 40,000 years BP (Knorosov 1999a, b:193). For a more detailed summary of linguistic studies and possible early dates for the settlement of the Americas see Chap. 9 in this volume.

### 11.5.4 *The Analysis of Myths*

The analysis of American traditional religious systems can help us understand early human spirituality in general, especially among pre-state societies. Although, linking religious beliefs and prehistorical events is tricky, as Yuri Knorosov notes: “we must strictly differentiate the legendary and real history.



The legendary history has the characteristic faults of being tradition, the transfer of legends between tribes to which it did not originally exist, just ignoring all the undesirable" (Knorosov 1999a, b: 214).

Attempts to use myths for reconstructing migrations based on the regional distributions of themes have been and are being made (Berezkin 2002). Typical mythological themes are united in several formal sections: "sun and moon," "origin of the surrounding world," "accident," "fire and laughter," "origin of the people and culture," "gender and sex, fertility and farming," "lost paradise," "supernatural objects, objects and creatures," "avenging heroes: American cycle," "the adventures I—acts of heroes," "the adventures II—monsters and evil spirits," "the adventures III—tricks and episodes 1–3" (Berezkin, database, 2014).

While some researchers have attempted to link specific common themes across broad expanses of the globe, with the possible result of reconstructing a proto-religion for early modern humans, this approach carries the innate danger of potential unification of ethnic groups which share no common past. Therefore, it is not surprising that Berezkin (2002:312), on the issue of the settlement of the Americas, will not project the roots of a proto-religion back beyond the end of the Paleolithic/early Neolithic.

## 11.6 The Necessity for the Interdisciplinary Approach

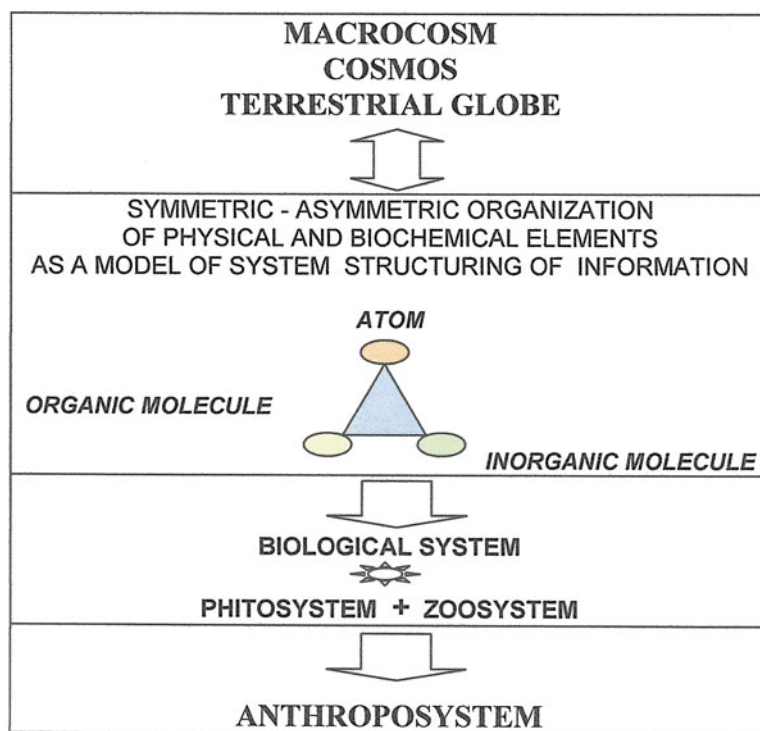
In the 1960s, Yuri Knorosov, a Russian historian who "has broken the Maya code" (Coe 1992), also spoke in favor of early dates for the penetration of the North American continent (suggesting a 40,000 year old date), moreover he insisted on several waves of populating the continent (Knorosov and Ershova 1988:251). Knorosov (1979, 1999a, b) believed that the languages of the immigrants of the first wave of settlement in the Americas, in particular the Mayan ancestors, were formed on the new continent, which is supposed by the fact that they could not be linked to any language of the Old World. However, he further argues that a second and third wave, which penetrated later consisted of people who spoke languages that emerged in Asia, which he argued could be traced in the linguistic materials on both sides of the Pacific. Many other researchers since have tried to link people across the Pacific; while many lines of data have been proposed, no widely accepted evidence has ever been presented. The debate over the possibility of trans-Pacific contact is still ongoing; however, increasingly more researchers are leaning away from it.

We still understand little about the racial and ethnic composition of the earliest peoples in the Americas. It is clear that they were Asian in origin and most researchers now believe they have roots in far northeast Asia; however, some people still bat around ideas of secondary waves from elsewhere. Alekseev (1991:7–8) saw this study of human race as the point where there is a transition from anthropology as a morphological discipline to a field of study in biology and human ecology, trying to depict the evolution of the biosphere, of man and his culture in a unified synthesis. This task becomes achievable when using the multidisciplinary anthroposystem methods, as I discuss below (Ershova 1999).

## 11.7 The Theory of Autoorganization of Anthroposystem as a Multidisciplinary Model of the Studies of Historical Process

The target of the anthroposystemic approach is to understand the whole history of humanity. Due to limitations in the biological approach to understanding the laws of civilization, I proposed "the theory of autoorganization of anthroposystem" (Ershova 1999, 2003). The anthroposystem arises from biology as a subfield (such as botany or zoology), which, in turn, originates from the study of the

**Fig. 11.1** Essential principles for the organization of systems in the Universe

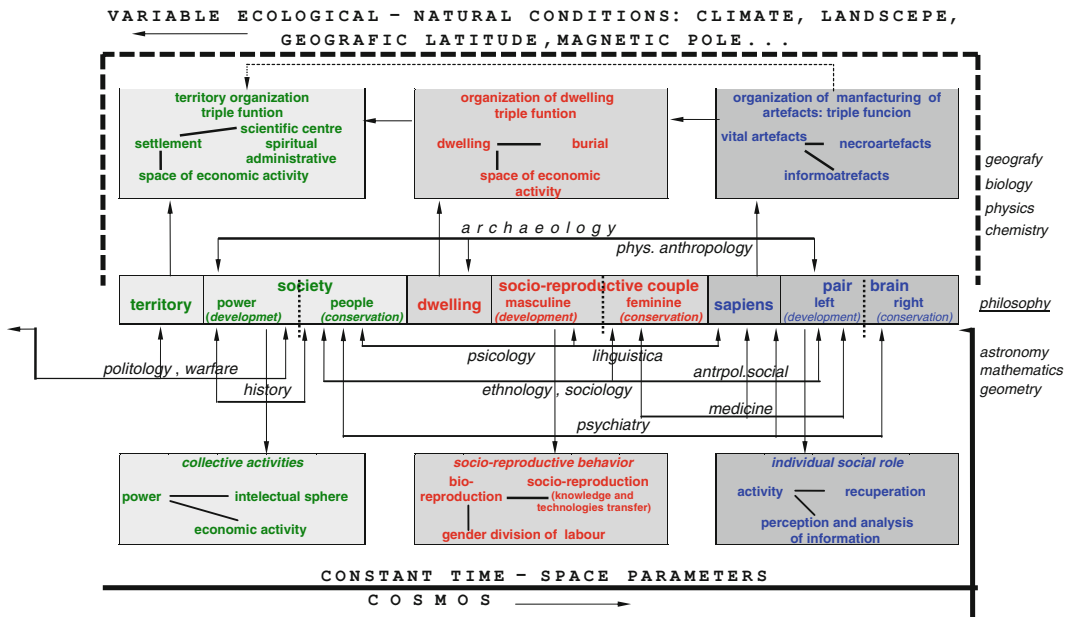


organic world, which is a form of autoorganization of the inorganic world, that a single whole (by its physical–chemical properties) for micro- and macro-Cosmos. It carries in itself uniform laws of autoorganization as its macro-system and is based on functional asymmetry (function of the system preservation verses function of the system status transformation), leading to qualitative changes of the system by transforming the morphology (transforming forms of symmetry). All this fully applies to socio-systems (Fig. 11.1).

The anthroposystem is a fragment of the universe, an auto-developing open subsystem, formed in the process of development of living nature and the evolution of humanity (*Homo sapiens*). It has common consistent fractal features and bifurcations, defined by the catalytic inhibitor, the spatial component. The anthroposystem differs from other systems by its targeted impact on the surrounding reality, the organization of artifacts of territorial space, and existence of specific information space. Anthroposystemic stability is not instantaneous—it is laid out on the chart of auto-development and depends on external variables: the ecological and natural environment and internal factors, which are expressing in the form of interaction of internal structures.

The fight and unity of asymmetric functions (preservation and change) of auto-developing objects serves as a mechanism which organizes and changes the inorganic and organic world, the biosphere and anthroposystem. This is expressed in continuous contradiction (changing of interdependent forms) between the functional asymmetry and morphological symmetry. As in every system and subsystem, the latter have their own expression, but they use similar typological features. Movement is the main principle of autoorganization, development, and stability of the anthroposystem. The process of anthroposystemic transformations is continuous and its discontinuity is only apparent when the observer does not understand the principle of its development.

The anthroposystem is the whole of humanity, autoorganized for the exploration of terrestrial space. This striving for systemic stability is composed of historically formed subsystems of different types (human communities), each of which “follows the path toward civilization with different speeds,



**Fig. 11.2** The scheme of self-organization of anthroposystem

but according to the same laws and to the same goal: increase in life expectancy through developing knowledge, targeted technological improvement, and modification of the surrounding world. The latter is provided by the following: energy consumption; sophistication of models of active adaptation to the environment; development of scientific knowledge and technologies, including social technologies; application of innovative effectors; rapid socio-intellectual reproduction of new generations” (Ershova 2013a:52) (Fig. 11.2).

The anthroposystem consists of four levels, each of which includes double functional asymmetrical elements (functional asymmetry on the principle of “preservation”—“change”), in the presence of the third “non-system” spatial element, which is the territory or land. The implementation of functional asymmetry in any of the levels without land is impossible, because, specifically, the space (territory) is the factor of energy that supplies each level. Thus the spatial component acts as a catalyst (or inhibitor) of the systemic processes.

The first level: brain (functional asymmetry: right/left hemispheres)—the brain functions are implemented by the person as a complex system.

The second level: the socio-reproductive couple—in different historical forms of the family (functional asymmetry: masculine/feminine). Functions are implemented in the material space of dwellings of the household. The basic function is procreation of descendants, which should assimilate knowledge and technologies of previous generations and create new ideas, otherwise the development of society is not ensured.

The third level: the society (functional asymmetry: the people/power). Functions are implemented on natural-artifact space that is the “territory.”

The fourth level: humanity as a whole should be considered the forth level: the anthroposystem. The obvious definition of “territory” is the Earth. Naturally there is a question of the definition of the functionally asymmetrical components in this system: the preservation component and the transformation component. There is also a question of determining the limit of anthroposystemic development.

The highest manifestation of preservation of the system condition is innovation or development, which will change the system condition for the sake of its stability. Subsystems survive only in the case of technologically-intellectual outpacing of neighbors. That subsystem survives, which proves the superiority (economic, intellectual, technological, organizational) over the competitor and which is expressed by steady increase in average life expectancy and decrease in the difference between male and female indicator.

Subsystems synchronously can be at different levels of civilization, focusing on the centers of progress. At each stage of the historical process, the centers of progress, as technologies improve, shifting from more comfortable regions (with a minimum risk for survival) to less comfortable (where survival is guaranteed by creation of the artificial environment, with a sharp increase in energy consumption). The process in subsystems either can be progressive or regressive. It depends on the correlation between the level of development and innovations and real challenges of the current aggressive natural or political environment.

The disappearance of the subsystem is manifested in the inability of a group to develop or defend its territory, as a source of energy that physically leads to the disintegration of society and its assimilation by another, more dynamic subsystem. The dynamically developing subsystems increase at the expense of the integration of other, less developed subsystems.

The speed of the historic process is not even and has definite dynamics. This temporal scale can be applied to the anthroposystem and to each of its subsystems. In the foundation of the construction of the scale is the principle of the temporal development of scientific knowledge, technology, economic and social technologies, as well as effectors (nonstandard breakthrough technologies) which characterize the level of development and stability of socio-system in general.

## 11.8 Conclusion

The Great Paleolithic Migration to the Americas allowed humans to explore the band of land from the 90° latitude in the north and 50° in the south. The ancient explorers were very well adapted to the adverse conditions of the glaciated northern latitudes. During the Neolithic, with higher population density, the development of technology and scientific knowledge increased. The first civilization centers were associated with plants domestication in the Old and New World. These first centers were formed in the tropics, including the American civilizations, as was pointed out by Nikolay Vavilov almost a century ago (Vavilov 1992).

Migrational processes are a form of adaptation (passive and active) of the human community to the pressures of the environment which stimulates the development of civilization. This process is an engine which enables separate anthroposystemic subsystems to form of a fundamentally new community: humanity as a whole with its new model of functional asymmetry.

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# Chapter 12

## Late Pleistocene Colonization of North America from Northeast Asia: New Insights from Large-Scale Paleogeographic Reconstructions

E. James Dixon

### 12.1 Introduction

Geologic and biotic events constrained the routes and timing of colonization of the Americas from northeast Asia. Researchers have defined two competing theories about the first movement of people from Asia to the Americas: an interior mid-continental route through a Late Wisconsin deglaciation corridor in central western Canada versus a maritime route along the Northwest Coast of North America. Paleoenvironmental and geologic data are summarized and used to evaluate the viability of each route at selected periods of time during the Late Pleistocene.

Large-scale paleogeographic reconstructions have been produced as a series of six maps of North America and Beringia (Fig. 12.1a–f). The maps integrate current data about changing sea level and glaciation over vast areas for the very Late Pleistocene (18,000–12,500 cal BP). These reconstructions are based on Geographic Information System (GIS) analyses and digital elevation modeling (DEM) compiled by Ehlers and Gibbard (2004) and Manley (2002).

The data are taken primarily from Ehlers and Gibbard's CDs 1 and 2 that were derived from various scholarly, public domain, and copyrighted sources. These include the public domain Digital Chart of the World (Rose 2004) and ESRI, Inc. (Ehlers and Gibbard 2004). ESRI used public domain sources and modified, cleaned, and transformed these data (ESRI Data License Agreement.pdf from Ehlers and Gibbard 2004, CDs 1 and 2). The integrated analysis also used Penn State URL DCW: [http://www.maproom.psu.edu/dcw/dcw\\_about.shtml](http://www.maproom.psu.edu/dcw/dcw_about.shtml) and Manley's Postglacial Flooding of the Bering Land Bridge: A Geospatial Animation employed ETOPO2v2c Global Gridded 2-min Database, NGDC Marine Geology and Geophysics Division, National Geophysical Data Center (NGDC), and National Oceanic and Atmospheric Administration (NOAA), URL: <http://www.ngdc.noaa.gov/mgg/global/etopo2.html> (Manley 2002). Radiocarbon dates were calibrated using IntCal 09 and OxCal 4.1 <http://c14.arch.ox.ac.uk>.

Integration of these data provides a paleogeographic foundation for diachronically interpreting the biological and geological constraints influencing the first human colonization of the Americans. These maps represent the synthesis of extensive glacial mapping, compilations of large numbers of

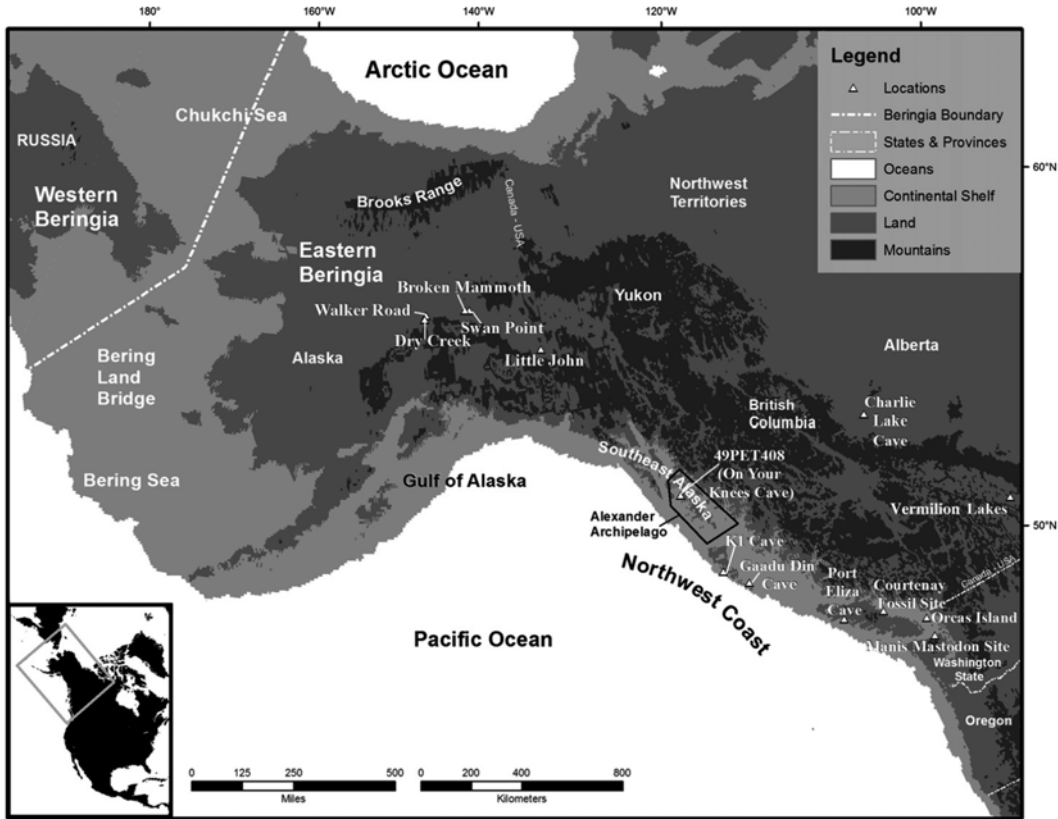
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**Fig. 12.1** Map of Northwest North America and adjacent maritime regions illustrating significant geographic locations and key archeological sites discussed in the text

radiocarbon determinations, and regional sea level curves. This scientifically accurate intercontinental scale interpretation more precisely defines the presence, absence, and character of paleogeographic corridors beginning about 18,000 cal BP (15,000  $^{14}\text{C}$  BP) (Fig. 12.1a) until circa 12,500 cal BP (10,500  $^{14}\text{C}$  BP) (Fig. 12.1f). The analysis couples the temporal and spatial deglaciation sequence of North America following the Last Glacial Maximum (LGM) with the progression of post-Pleistocene sea level rise on the Bering and Chukchi continental shelves (Fig. 12.1a–f). By comparing synchronic events in the interior of northern North America with the Northwest Coast, the parameters limiting and facilitating human colonization are more clearly identified and linked to archeological evidence necessary to define the character and timing of colonization.

## 12.2 Mid-Continental Route

Nearly 80 years ago, Johnston (1933) suggested the possibility that a relatively narrow strip of unglaciated land may have existed in Canada between the Laurentide and Cordilleran ice sheets during the Late Wisconsin glaciation of North America. If this relatively narrow “ice-free corridor” had existed, it would have provided a terrestrial environment between Asia and areas south of the continental glaciers through the LGM. Theoretically, such a corridor would have enabled the dispersal of plants, animals, and humans between these two regions during late-glacial times. The idea of an

“ice-free corridor” has played a significant role in stimulating field research and efforts to interpret North American biogeography, glacial history, and archeology.

Multidisciplinary evidence resulting from a number of independent investigations led an increasing number of investigators to conclude that an ice-free corridor did not exist throughout the Late Wisconsin (Burns 1996, 2010; Jackson and Duk-Rodkin 1996; MacDonald 1987; Wilson 1983, 1990, 1996). There is now broad consensus that a corridor did not exist during the LGM (Fig. 12.1a). Because of the confusion generated by the application of the term “ice-free corridor,” several researchers have suggested alternative terminology defined strictly on geographic grounds including “Western Corridor” (Beaudoin 1989) and “western interior route” (Burns 1996:111). The opening of the ice-free corridor (or more accurately stated, deglaciation corridor) probably occurred between 15,000 and 14,000 cal BP (12,500–12,000  $^{14}\text{C}$  BP) (Dyke 2004) (Fig. 12.1c, d). This construct of the glacial geology is based primarily on glacial mapping and radiocarbon dating. It defines constraints that provide a useful framework for interpreting the colonization of the Americas.

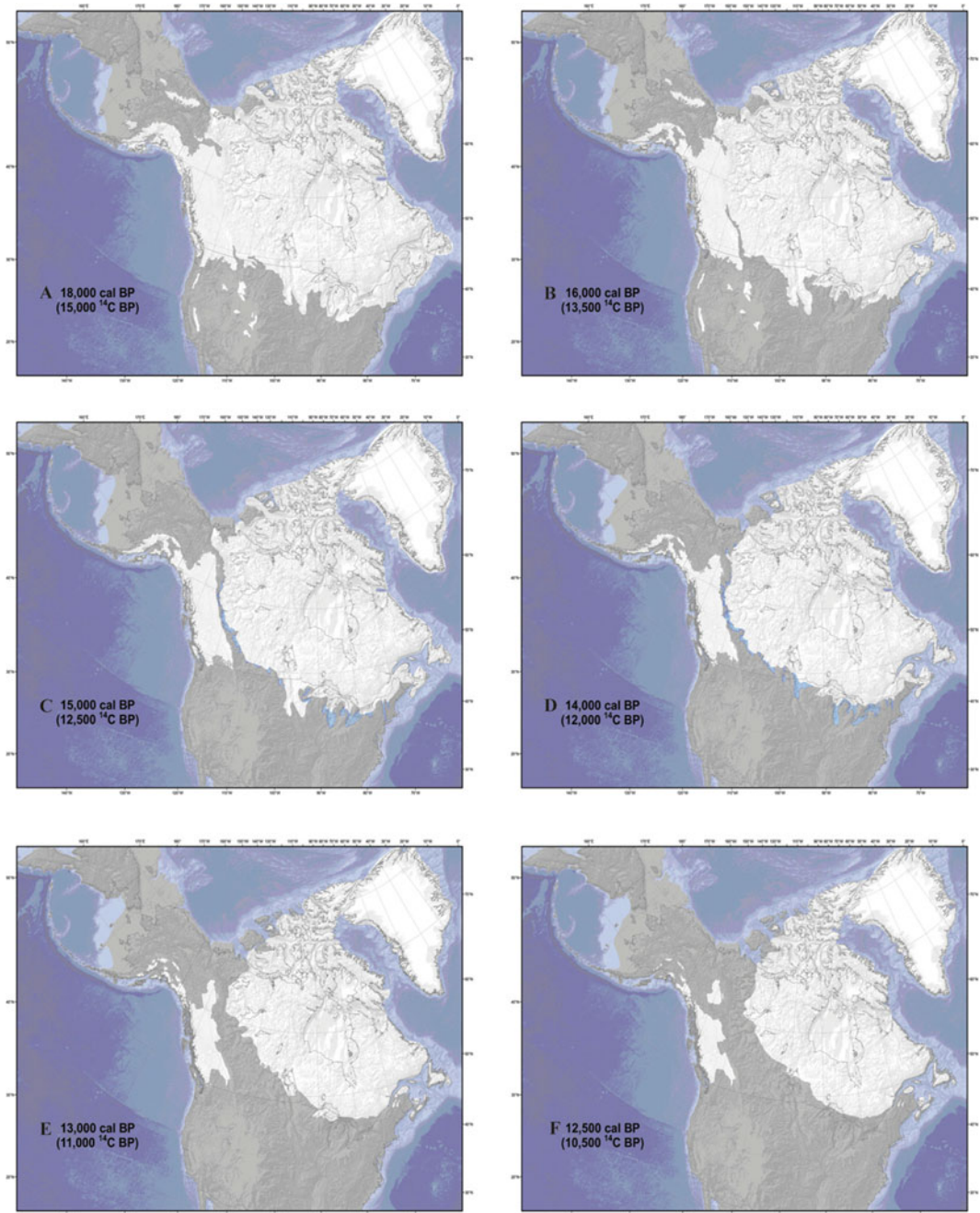
These data indicate that by at least 14,000 calendar years ago (12,000  $^{14}\text{C}$  BP) (Fig. 12.1d), a narrow deglaciation corridor had opened between the Laurentide and Cordilleran glaciers in west central Canada. The processes of deglaciation reestablished a terrestrial connection between eastern Beringia and regions south of the continental glaciers. It enabled the migration of terrestrial plants and animals southward from Beringia and northward from areas south of the continental glaciers from distinctly different environments that had been isolated from each other for about 10,000 years (Young et al. 1994). The mid-continental deglaciation corridor was significantly different than other newly deglaciated regions because it lay sandwiched between two massive wasting continental glaciers. Most newly deglaciated terrain at the end of the Pleistocene was adjacent to large biomes and this enabled biological colonization to occur rapidly along a broad front. However, the deglaciation corridor was unique in that it had only two relatively narrow openings to larger adjacent ecosystems at its northern and southern extremes (Fig. 12.1c, d). The geographically restricted termini of the deglaciation corridor greatly limited the opportunities for species colonization.

This newly created terrain was restricted by massive melting glaciers on two sides and this created formidable difficulties for human colonization. Immediately following deglaciation it was a relatively narrow strip of terrain (Fig. 12.1c) that was geologically unstable and biotically impoverished. Initially, the deglaciation corridor was characterized by shifting streams, rivers, melt water channels, regions of stagnant debris covered ice, strong katabatic winds, outburst floods, and irregular shifting glacial deposits (Clague et al. 2004; Mandryk et al. 2001; Wilson 1996; Wilson and Burns 1999). Melt water lakes filled large areas between the receding continental glaciers (Fig. 12.1c, d) (Dyke 2004:388–389; Smith 1994; Smith and Fisher 1993). Large proglacial lakes and soft, boggy substrates of the continuous and progressively deglaciating terrain were impediments to recolonization of the corridor by large mammals (Burns 2010). Fiedel (2004) suggests the proglacial lakes may have been attractive “oases” to facilitate human migration through the corridor. Although the lakes may have provided temporary seasonal habitat for migratory waterfowl that may have transported seeds for colonizing plants into the region, they appear to have been relatively short lived and biotically impoverished. Geologic evidence indicates the newly formed glacial lakes were silt laden and probably had few freshwater aquatic resources. There is no paleontological evidence to suggest the presence of fish, beaver, muskrat, waterfowl, or aquatic plants during the early period of deglaciation. Floral resources in the deglaciation corridor were scarce also. Based on an evaluation of the pollen data from the deglaciation corridor, Mandryk (1990:77) concluded that it was “unlikely that such a sparse vegetation in harsh climatic conditions could have supported viable human populations.”

As deglaciation progressed, the Late Wisconsin fauna of western North America, south of the ice sheets, advanced northward. Slightly later, elements of the predominately Asian fauna of eastern Beringia colonized the new terrain of the deglaciation corridor from the north. The paleontological record suggests that southern small-horned *Bison* moved northward, and replaced the Late Pleistocene large-horned *Bison* occupying Alaska and northwestern Canada (MacDonald and Cook 2009:227; Shapiro et al. 2004). This may suggest that plants and animals originating from the southern end of the corridor had an

advantage colonizing northward as the climate warmed. Conversely, northern species may have been at environmental disadvantage in their attempts to colonize southward as deglaciation progressed.

Wilson (1996) suggests that establishing the chronology for the arrival of bison may be one of the most informative methods for timing the “ecological opening” of the deglaciation corridor. Bison are



**Fig. 12.2** Last Glacial Maximum (LGM) deglaciation sequence in relation to sea level rise on the Bering Land Bridge between 18,000 cal BP (15,000  $^{14}\text{C}$  BP) and 12,500 cal BP (10,500  $^{14}\text{C}$  BP). Extent of glaciation in relation to sea level: **A**) circa 18,000 cal BP (15,000  $^{14}\text{C}$  BP); **B**) circa 16,000 cal BP (13,500  $^{14}\text{C}$  BP); **C**) circa 15,000 cal BP (12,500  $^{14}\text{C}$  BP); **D**) circa 14,000 cal BP (12,000  $^{14}\text{C}$  BP); **E**) circa 13,000 cal BP (11,000  $^{14}\text{C}$  BP); **F**) circa 12,500 cal BP (10,500  $^{14}\text{C}$  BP)

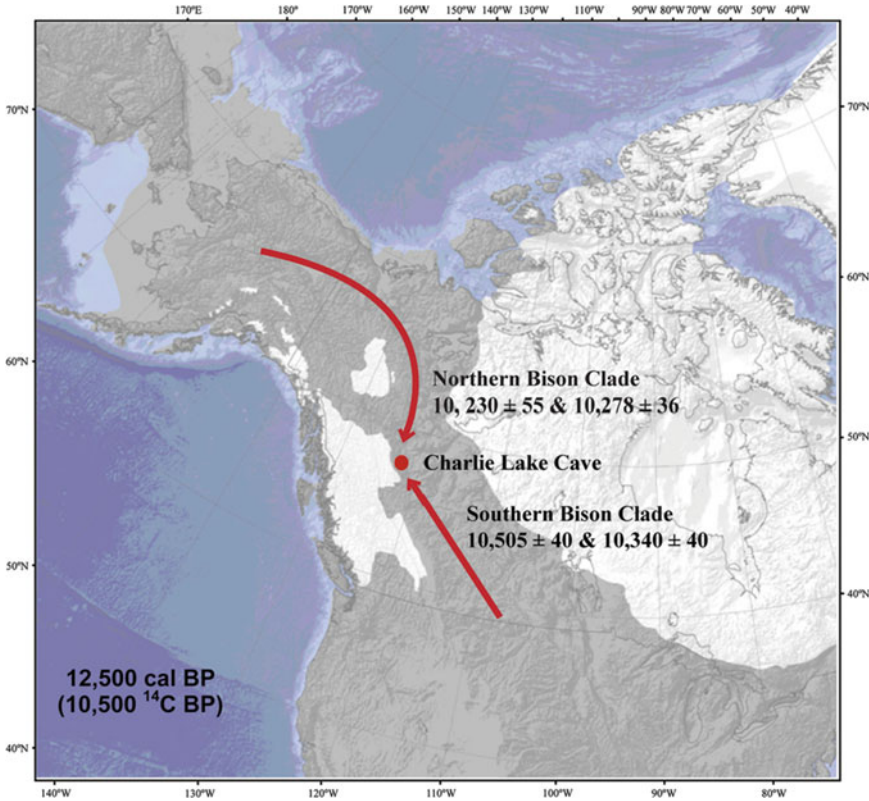


useful because they disperse over vast areas in relatively short periods of time and their remains are abundant. Charlie Lake Cave is located in eastern British Columbia about half way between the northern and southern termini of the deglaciation corridor (Fig. 12.2). Subsequent morphological and DNA analyses suggests that classification of eastern Beringian bison (traditionally classified as *B. occidentalis*) may require reassessment (Wilson et al. 2008). Although the northern clade is genetically distinguishable from the southern clade, it is primarily on the basis of extensive mitochondrial diversity. This reanalysis provides additional evidence that primary dispersal of North American bison was by *B. antiquus* northward from the northern plains to eastern Beringia (Wilson et al. 2008). Several artifacts have been recovered from the oldest archeological component (Component 1) at the cave including a projectile point that the investigators suggest was derived from the late fluted point tradition to the south (Fladmark et al. 1988; Driver et al. 1996). MtDNA analysis of four bison bones from Component 1 at Charlie Lake Cave indicates that the bison bones are from two distinct clades (bison that share homologous features and common ancestry). Two radiocarbon determinations run on bison bones from the northern (eastern Beringian) clade were dated to  $10,230 \pm 55$  [12,145–11,713 (94.4%) cal BP] and  $10,378 \pm 36$   $^{14}\text{C}$  BP [12,401–12,086 (95.4%) cal BP]. Two specimens from the southern (North American plains) clade dated to  $10,505 \pm 40$  [12,601–12,225 (95.4%) cal BP] and  $10,340 \pm 40$   $^{14}\text{C}$  BP [12,389–12,035 (95.4%) cal BP] (Driver 2001; Shapiro 2003; Vallières 2004). The bison remains from the northern and southern clades recovered from Charlie Lake Cave provide a minimum limiting date for the ecological opening of the central areas of the deglaciation corridor and suggest the deglaciation corridor may have been suitable for human subsistence by about 11,500–11,000  $^{14}\text{C}$  BP (13,500–13,000 cal BP). These dates correlate well with dated bison and horse bones from southern Alberta and indicate that by circa 11,000–11,500  $^{14}\text{C}$  BP (13,500–13,000 cal BP) these large mammal species had begun to colonize deglaciated areas of the southern corridor (Burns 1996, 2010). Wilson (1996) regards the period 13,000–12,500 cal BP (11,000–10,500  $^{14}\text{C}$  BP) (Fig. 12.1e, f) prior to forestation as the critical interval during which bison were able to expand their range into the deglaciation corridor.

The oldest reliably dated archeological evidence from the southern region of the deglaciation corridor is from locality A at the Vermillion Lakes Site where a series of radiocarbon determinations date the occupation between circa 10,800 and 10,300  $^{14}\text{C}$  BP (Fedje et al. 1995). The fact that there are no other reliably dated archeological sites from the deglaciation corridor until circa 10,500  $^{14}\text{C}$  BP (12,500 cal BP) has been interpreted by several researchers as additional evidence suggesting the deglaciation corridor was biotically impoverished and not capable of supporting hunter gatherers (Driver 1996; Driver et al. 1996; Fladmark 1996; Jackson and Wilson 2004; Wilson 1983). Although para-glacial processes may have destroyed many of the earliest sites (Driver 1998), the apparent lack of older archeological sites suggest that there may have been as much as a 500 year lag from the time the corridor was free of surface ice until geological stability and ecological productivity were sufficiently advanced to permit colonization by large mammals and people.

As early as the 1960s archeologists began to suspect that the Paleoindian tradition artifacts were younger in eastern Beringia than they were in areas south of the continental glaciers. These early observations were based on the fact that the northern examples typologically resembled artifacts that dated to the later periods of the Paleoindian tradition from the western Great Plains (Wormington and Forbis 1965) or from geologic contexts that suggested they were possibly younger than comparable examples found south of the continental glaciers (Dixon 1976). Fluted projectile points from eastern Beringia are typologically distinct and generally exhibit multiple basal flutes, or basal thinning flakes (Fig. 12.3). Many exhibit basal edge grinding and they are generally not as finely flaked and smaller than examples from the North American plains. The projectile points from eastern Beringia more closely resemble typologically similar projectile points from western North America (Willig et al. 1988), and this suggests they may trace their origins to the intermountain adaptations of the far western regions of North America, south of the continental glaciers.

The creation of unoccupied habitat as a result of deglaciation necessitates an actual movement of people northward rather than the transmission of material cultural traits northward by diffusion (transmitted from one group to the next). The archeological evidence from professionally excavated



**Fig. 12.3** Glacial limits circa 12,500 cal BP (10,500  $^{14}\text{C}$  BP) depicting the location of Charlie Lake Cave radiocarbon dated bison remains. *Arrows* are used to illustrate the southern movement of the northern clade of bison and the northern movement of the southern clade that made contact by circa 12,500 cal BP (10,500  $^{14}\text{C}$  BP)

and well-dated pre-Clovis archeological sites south of the continental glaciers also suggests much earlier dates for the initial colonization of the Americas. Monte Verde (Dillehay 1984, 1988, 1997), Cactus Hill (Jones and Johnson 1997; McAvoy and McAvoy 1997), Meadowcroft Rock Shelter (Adovasio et al. 1990; Adovasio and Pedler 2004), the Chesrow complex (Overstreet 1993, 1998), Miles Point (Lowery et al. 2010), and other sites suggest that human entry into the Americas occurred prior to the emergence of an ecologically viable mid-continental deglaciation corridor about 13,000 cal BP (11,000  $^{14}\text{C}$  BP). Because these archeological sites predate the physical emergence and ecological viability of the interior deglaciation corridor, humans had to have colonized regions south of the continental glaciers via another route.

There is now general consensus among archeologists working in eastern Beringia that the Paleoindian tradition first appears in eastern Beringia about 12,500 cal BP (10,500  $^{14}\text{C}$  BP) (Goebel and Buvit 2011). People living south of the continental glaciers expanded northward along with the northward movement of bison and other species colonizing the deglaciation corridor from the south.

The earliest reliably dated sites in eastern Beringia are Swan Point (Holmes 2001, 2011; Holmes and Crass 2003) and the Little John Site (Easton et al. 2011). Both of these sites date to 14,000 cal BP and demonstrate that humans were firmly established deep in the interior of eastern Beringia during late glacial times. These and other early eastern Beringian sites have sequences of occupations that are sometimes, but not always, characterized by microblade industries. By about 13,000 cal years ago small triangular, concave base, and basally thinned point types appear at several of these sites. Sometimes they are found in association with the Dyuktai microblade assemblages and sometimes they are not. The appearance of this bifacial technology in eastern Beringia at this time may be the



tangible evidence of contact between the people of eastern Beringia with the Paleoindian population moving northward through the newly established deglaciation corridor at the end of the Pleistocene (Dumond 2011).

## 12.3 Northwest Coastal Corridor

Interdisciplinary research during the past two decades has developed extensive information about the Quaternary geology, sea level history, and paleoecology of the Northwest Coast. Although some researchers recognized the potential significance of the Northwest Coast as a possible LGM migration corridor to the Americas (Heusser 1960; Fladmark 1978, 1979; Gruhn 1994), prior to 1990 the region received comparatively little scientific attention. This was because early geologic interpretations hypothesized that during the Late Pleistocene the region had been covered by a continuous ice sheet extending westward from the mainland across the islands of the Northwest Coast to terminate at or near the edge of the continental shelf (Coulter et al. 1965; Prest 1969; Nasmith 1970). However, subsequent field research indicates that sizable areas of Southeast Alaska were ice free along the inner continental shelf during and toward the end of the LGM (Ager et al. 2010; Carrara et al. 2003; Clague et al. 1989; Hetherington et al. 2004; Kaufman and Manley 2004; Mann 1986; Mann and Hamilton 1995; Reger and Pinney 1996).

Unlike the mid-continental deglaciation corridor that restricted biological colonization to relatively small northern and southern openings, the Northwest Coast was adjacent to the Pacific Ocean that provided a source for immediate biological colonization along its broad western front. Also coastal refugia provided locales from which established populations of fish, marine mammals, and avifauna, as well as terrestrial plants and animals, were immediately able to colonize newly deglaciated habitats.

The timing of the LGM was not the same through western Canada and the Gulf of Alaska, and timing of the maximum ice advance varied locally (Clague et al. 2004:86). In southeast Alaska and British Columbia, the LGM occurred between 29,000 and 18,000 cal BP (25,000–15,000  $^{14}\text{C}$  BP) (Mann 1986). During the LGM, perhaps lasting until about 18,000 cal years ago, sea level was about 100–120 m lower than it is today and many large glaciers along the Gulf of Alaska extended to the edge of the continental shelf. Vast areas along adjacent regions of the coast may have been deglaciated beginning about 16,000 cal BP (13,500  $^{14}\text{C}$  BP) (Blaise et al. 1990; Bobrowsky et al. 1990) possibly providing a coastal corridor for people using watercraft to move south along the coast from eastern Beringia. Mann and Peteet (1994:146) indicate that except for a 400-km coastal area between southwest British Columbia and Washington State, the Northwest Coast of North America was ice free by 16,000 cal BP (Fig. 12.1b).

Extensive Late Pleistocene vertebrate fossil deposits have been discovered at On Your Knees Cave and several other caves in the Alexander Archipelago dating between 35,400 and over 44,500 years BP (prior to the LGM). This research has led to a preliminary history of colonization and extinction of vertebrates on the islands of the Alexander Archipelago by Heaton and Grady (2003). The research demonstrates that during the LGM and early postglacial times the archipelago supported several high-latitude cold-adapted species of mammals including brown bear (*Ursus arctos*), red (*Vulpes vulpes*) and arctic fox (*Alopex lagopus*), caribou (*Rangifer tarandus*), ringed seal (*Phoca hispida*), and marmot (*Marmota caligata*). These species became extinct in the Alexander Archipelago and/or migrated to higher latitudes as the climate warmed at the end of the LGM.

Direct radiocarbon dates on ringed seals from caves in the Alexander Archipelago demonstrate their occurrence throughout the LGM when the climate was colder and characterized by extensive sea ice (Heaton and Grady 2003). Today ringed seals primarily occupy the Arctic Ocean, Baltic and Bering Seas, and Hudson Bay. These cold-adapted marine mammals are closely associated with sea ice and ice flows and they retreated northward as the climate along the Northwest Coast became increasingly temperate at the end of the Pleistocene. The LGM presence of common seal (*Phoca*

*vitulina*), also known as the harbor or spotted seal, is significant. Today harbor seals range throughout the north Pacific Rim, from the Bering and Chukchi Seas southward to California. They breed both on ice and land. In most areas they depend on beaches and offshore rocks for birthing, resting, and molting (ADF&G 1973). Their habitat requirements support geologic interpretations indicating the existence of unglaciated refugia during the LGM (Carrara et al. 2007).

Heaton and Grady (2003) have also dated Stellar Sea Lion (*Eumetopias jubata*) to the early LGM in southeast Alaska. Farther to the south this same species has been dated to about 14,570 cal BP ( $12,570 \pm 70$   $^{14}\text{C}$  BP) at the Courtenay fossil site on Vancouver Island, British Columbia (Harrington et al. 2004). Like harbor seals, the range of Stellar Sea Lion extends from California's Channel Islands along the north Pacific Rim to northern Japan. During the breeding season (June) they require land where they form rookeries. When traveling and feeding, they often rest on headlands and offshore rocky islets. These large marine mammals can weigh as much as 2,400 pounds and, like harbor and ringed seals, they feed on a variety of marine foods including rockfish, sculpin, greenling, sand lance, smelt, salmon, halibut, flounder, octopus, shrimp, and crab (ADF&G 1973). A large number of avian and fish remains have also been excavated from the caves of the Alexander Archipelago; however, much of this collection remains unidentified and undated.

The caves in which the Alexander Archipelago marine mammal fossils were found are generally located within 1 km of the coast and at elevations higher than sea level. Many of the bones exhibit modification by carnivores, such as punctures and gnaw grooves, indicating that they were transported to the caves by predators and/or scavengers. Arctic and red fox remains are directly dated to the LGM and these animals may have transported some of these remains to the caves (Heaton and Grady 2003). Radiocarbon determinations run directly on the bones of brown and black bear, caribou, and river otter bracket the LGM. These and other data led Heaton and Grady (2003:46) to suggest that these species likely survived the LGM in coastal ice-free refugia along with the arctic marine fauna documented by well-dated pinnipeds.

The presence of ringed and harbor seals and sea lion dating to the LGM inferentially indicate the presence of their prey that include a wide variety of fish, crustaceans, and cephalopods. Although much more work remains to be done, collectively these data suggest that marine resources and biotically viable coastal refugia were present along the Northwest Coast during the LGM. At this time (29,000–18,000 cal BP) the ocean supported large marine mammals, birds, and fish. Terrestrial plant and animal resources were available in refugia.

In addition, fossil evidence of brown and black bears, as well as genetic studies conducted on living bear populations, suggest that these species may have been continuous long-term residents along the Northwest Coast (Heaton et al. 1996). These large omnivores feed on a variety of plants, berries, roots, and fungi, as well as fish, insects, and mammals. Most brown bears derive most of their dietary energy from vegetable matter, and, like humans, their diet varies greatly based on resource availability and opportunity in different areas. The study of the diets of prehistoric vertebrates on the islands derived from stable isotope analysis, the distribution of endemic mammals, and pollen and plant macrofossil analysis provide insights into past environmental conditions and better understanding of the ecological interactions among species during various stages of deglaciation (Carrara et al. 2007; Clague et al. 2004; Heaton and Grady 2003; MacDonald and Cook 1996).

On Your Knees Cave (49-PET-408) is located on Protection Head, a peninsula at the northwest end of Prince of Wales Island in southeast Alaska (Fig. 12.4). Humans used the cave repeatedly for approximately 12,000 cal years BP. It contains bone and shell tools from different chambers of the cave ranging between  $10,300 \pm 50$   $^{14}\text{C}$  BP and  $1,760 \pm 40$   $^{14}\text{C}$  BP, documenting several periods of human use. The most extensive use of the cave occurred about 9,200  $^{14}\text{C}$  BP and is associated with the oldest human remains known from the Northwest Coast. Carbon isotope values from human bone suggest the individual was raised primarily on a diet of marine foods. Obsidian associated with the human remains is from Mt. Edziza in British Columbia and Suemez Island in southeast Alaska (Lee 2001). The location of the site on an island, the use of obsidian from sources on the mainland and another island, and the isotopic values derived from human bone suggests that the people who used the site



**Fig. 12.4** Northern Paleoindian fluted projectile points from eastern Beringia (Dixon, 1999:188)

were coastal navigators with an economy based on maritime subsistence. In addition, they directly procured, or had established trade networks to obtain, obsidian and other tool stone that required the use of watercraft. A worked bone tool dated to 10,300  $^{14}\text{C}$  BP is the oldest artifact recovered from the site (Dixon 2001; Dixon et al. 1997).

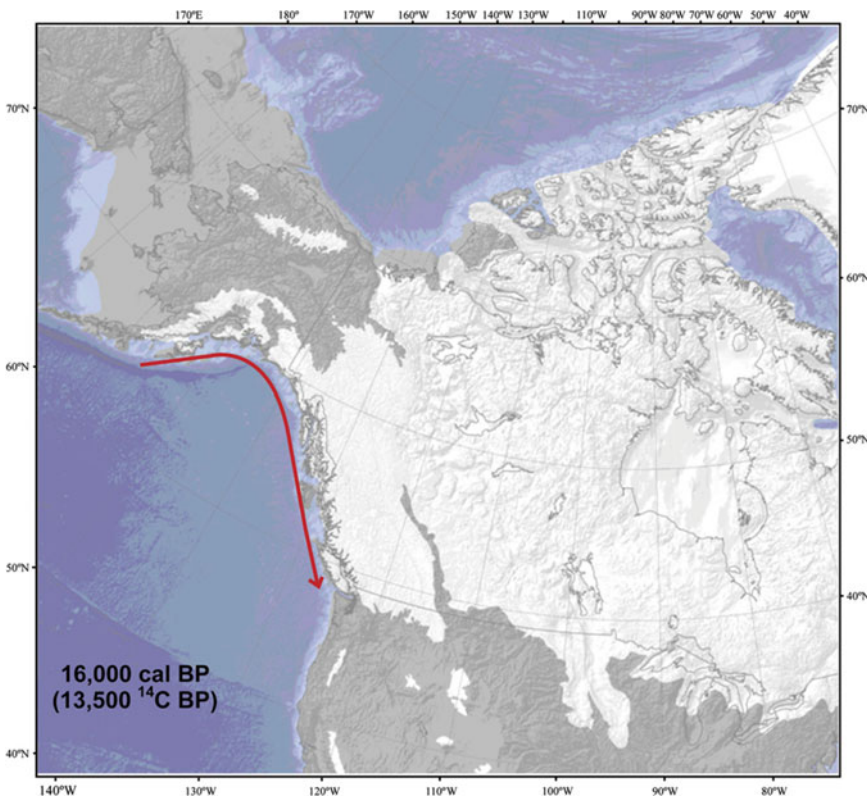
The southern end of the coastal corridor was suitable for human occupation before circa 18,000 cal years BP, and again about 16,000 cal years BP. At Port Eliza Cave located on the west of Vancouver Island, British Columbia, a suite of radiocarbon determinations document vole, mountain goat, marmot, numerous species of fish including salmon, birds, and mollusks between about 20,000 and 18,000 cal BP (circa 18,000–16,000  $^{14}\text{C}$  BP) (Al-Suwaidi et al. 2006). There is a hiatus in the faunal record between about 18,000 and 14,500 cal years ago when the site appears to have been glaciated. Mountain goat remains dating to circa 14,500 cal BP deposited in the Cave demonstrates that the ice had retreated by this time. Analysis of the sediments and the cave's flora and fauna indicate that this region of the coast was unglaciated and biotically capable of sustaining humans prior to 18,000 cal BP and after 14,500 BP (Al-Suwaidi et al. 2006).

At K 1 Cave on the Queen Charlotte Islands (Haida Gwaii) bear bones have been radiocarbon dated at  $14,390 \pm 70$ ,  $11,250 \pm 70$ , and  $11,150 \pm 50$   $^{14}\text{C}$  BP and indicate sufficient biotic resources during this time to sustain these large omnivores (Ramsey et al. 2004). Basal fragments of two bifacial projectile points were also recovered from the cave directly associated with bear bones dated to circa 10,600  $^{14}\text{C}$  BP (Fedje et al. 2008). A typologically similar projectile point was recovered from Gaadu Din 2 cave associated with a date of 10,220  $^{14}\text{C}$  BP (Fedje et al. 2008).

The data from Vancouver Island and the Alexander Archipelago suggest that the LGM was diachronous along the Northwest Coast and that glaciation reached its maximum extent during the interval between circa 20,000 and 16,000 cal years ago. These data demonstrate that during the LGM ice conditions were severe. Some terrestrial plants and animals survived in refugia along the coast; and marine species, such as ringed seal, survived in locally favorable marine environments. Refugia along the coast appear to have served as centers for biotic dispersal immediately following deglaciation about 16,000 years ago

While it is a theoretical possibility that humans with high-latitude maritime adaptations may have been able to “island hop” using watercraft between refugia along the Gulf of Alaska and Northwest Coast, this would have been a difficult and dangerous undertaking. At the height of the LGM many large glaciers extended from the coastal mountains to the edge of the continental shelf. Many of these large calving glaciers were tens of kilometers across (Carrara et al. 2003; Clague et al. 2004) and probably presented significant barriers separating refugia and inhibiting movement along the coast. Although it is evident that subsistence resources including fish, birds, and large marine mammals were present in some areas, travel between refugia seems unlikely at that time. However, travel would become safer prior to the onset of the LGM and again when the glaciers receded and refugia expanded during the end of the LGM (Fig. 12.5).

As deglaciation began, the coasts of Alaska and British Columbia were dynamic and rapidly changing environments. Melting glaciers released water into the oceans, causing sea level to rise.



**Fig. 12.5** Extent of glaciation and sea level circa 16,000 cal BP (13,500 <sup>14</sup>C BP) illustrating deglaciated islands and areas of the continental shelf. The arrow depicts the postulated route of human colonization to southern regions of the Americas predating the opening (deglaciation) of the mid-continental corridor

At the same time, deglaciation removed tremendous weight from the land causing it to rebound at different rates depending on the load of LGM ice. Also at the same time, tectonic movement of the massive plates forming the earth's crust contributed to changes of sea level relative to the land. The timing and scale of these three processes largely determined the location of the shoreline and its movement through time.

Data suggest that deglaciation progressed more rapidly along the coast than in the interior of the continent as a result of warm Pacific water (Clague et al. 2004). Brown bear are reliably dated in the Alexander Archipelago by 14,949–13,888 (95.4%) cal BP ( $12,295 \pm 120$   $^{14}\text{C}$  BP) (Heaton and Grady 2003:29). Other terrestrial species, such as caribou were expanding their range from LGM refugia (Heaton and Grady 2003). Warmer water maritime species were established offshore and along the coast, and ringed seals retreated north. Based on an analysis of interdisciplinary paleoecological data from the north and west Pacific Rim, Erlandson et al. (2007) suggest a “kelp forest ecosystem” stretched from Japan to Baja California during Late Pleistocene/Early Holocene times. They hypothesize that this continuous ecosystem could have facilitated migration by coastal-adapted people along the southern coast of Beringia from northeast Asia to North America possibly as early as 16,000 years ago.

At the southern end of the coastal corridor, Late Pleistocene bison (*Bison antiquus*) remains have been reported from three different localities on Vancouver Island and another six sites on Orcas Island (Fig. 12.4). Radiocarbon determinations indicate that these specimens range in age between approximately 11,750 and 10,800  $^{14}\text{C}$  BP (13,750–12,800 cal BP). These discoveries, and the mountain goat bones from Port Eliza Cave, indicate that these islands were connected to the mainland at the end of the Pleistocene (Wilson et al. 2009). Taphonomic analysis of the bison remains from the Ayer Pond site on Orcas Island dating to  $11,760 \pm 70$   $^{14}\text{C}$  BP suggest to the investigators that the bison at this site may have been butchered by early hunters (Wilson et al. 2009). Two radiocarbon dates ( $11,850 \pm 60$   $^{14}\text{C}$  BP and  $12,000 \pm 310$   $^{14}\text{C}$  BP) run on seeds and wood associated with bison and mastodon remains from the Manis Mastodon site indicate that these species were present on the Olympic Peninsula in Washington (Gustafson et al. 1979). The growing bodies of data suggest that at the southern terminus of the Northwest Coastal corridor early human settlers may have encountered the Late Pleistocene large mammal fauna of North America that are commonly associated with Paleoindian sites elsewhere on the continent.

If ever there was an ice-free corridor during the LGM, it was not in the interior regions of northern North America, but along the Northwest Coast. Although the growing body of data demonstrates the *possibility* of human colonization along the Northwest Coast during the LGM, it is not until sometime between 17,000 and 15,000 cal BP that the deglaciation was sufficiently advanced to create a relatively safe and biotically continuous corridor along the coast (Fig. 12.5) (Dixon 1999, 2001). An earlier migration along the Northwest Coast sometime prior to about 20,000 years is also possible, but there are insufficient archeological data to support it. Compared to the mid-continental deglaciation corridor, the coastal corridor was deglaciated earlier and became ecologically viable thousands of years earlier.

## 12.4 Discussion

It is still not known when, how, or why people first colonized the Americas. Converging lines of evidence corroborated by independent research from several disciplines including archeology, geology, and paleontology, all confirm that a terrestrial “ice-free corridor” did not exist during the LGM. Evidence suggests that a geologically stable and environmentally viable terrestrial corridor between eastern Beringia and regions south of the continental ice was not available for human occupation until circa 13,000 cal BP (11,000  $^{14}\text{C}$  BP). People colonizing the corridor from the south possibly made



contact with the inhabitants of eastern Beringia sometime about 13,000 cal BP. People had settled areas of North America south of the continental glaciers prior to deglaciation, and must have reached areas south of the continental ice by a way other than a mid-continental terrestrial route.

This analysis illustrates that the Bering Land Bridge connected the Americas to Asia prior to 18,000 cal BP (15,000  $^{14}\text{C}$  BP) until about 10,000 cal BP. However, eastern Beringia remained a terrestrial extension of Asia terminating in a “cul de sac” blocked by glaciers until a biotically viable deglaciation corridor was established about 13,000–12,500 cal BP (11,000–10,500  $^{14}\text{C}$  BP). A biologically viable corridor stretched along the Northwest Coast from the southern coast of the Bering Land Bridge to regions south of the continental glaciers by about 16,000 cal BP (13,500  $^{14}\text{C}$  BP).

The coastal corridor has been criticized because no sites older than about 12,500–13,000 years old have been documented along the Northwest Coast. It is important to recognize that several Northwest Coast sites (On Your Knees Cave, K 1 Cave, and Gaadu Din 2) are equal in age, and possibly older than, sites dated in the area of the mid-continental deglaciation corridor. Erlandson et al. (2008) have documented human occupation of all the major regions of the Pacific Coast by at least 13,000–11,500 cal BP. Occupation of the Pacific coastal zone of the Americas is contemporaneous with Folsom and Clovis period occupations in the interior regions (Erlandson et al. 2008). Researchers suspect that older sites along the Northwest Coast may have been submerged by post-Pleistocene sea level rise. Archeological site predictive modeling and survey on the adjacent continental shelf along the Northwest Coast is necessary to test these hypotheses (Josenhans et al. 1997; Monteleone and Dixon 2010). There is considerable potential for discovering Late Wisconsin age sites dating to the time of the coastal corridor along the Northwest Coast; however, the potential for Late Pleistocene age archaeological sites in the interior mid-continental corridor is extremely low.

Traditionally the colonization of North America from Asia has been envisioned of as a terrestrial migration of people moving from Asia across the Bering Land Bridge and then southward from Beringia immediately following deglaciation, or earlier through the hypothetical ice-free corridor. However, these data suggest that areas south of the continental glaciers had been colonized prior to the establishment of a geologically stable and biotically viable deglaciation corridor. Archeological data indicate that people employing late Paleoindian technology began to move northward from areas south of the continental glaciers and that artifacts ascribed to the Paleoindian tradition do not appear in eastern Beringia until about 12,500 cal BP (10,500  $^{14}\text{C}$  BP).

Alternative routes to the Americas are few, with all remaining LGM colonization hypotheses requiring the use of watercraft. Based on the genetic and linguistic relationships between most Native Americans and northeast Asians, northeast Asia appears to be the most probable region of origin for the first Americans. Consequently, human colonization along Northwest Coast, either prior to or subsequent to the LGM, along the North Pacific Rim appears to be the most viable hypothesis for an initial migration from northeast Asia based on the current state of knowledge. However, the growing body of data suggests that colonization of the American continents was complex process possibly taking thousands of years involving multiple migrations possibly from different areas of the world.

**Acknowledgments** Ronald Stauber, Office of Contract Archaeology, University of New Mexico, integrated the Ehlers and Gibbard (2004), Manley (2002), and other databases to generate the paleogeographic reconstructions illustrated in this chapter. Kelly Monteleone, Michael Grooms, and Mark Williams provided valuable graphic and technical support. I thank the Harvard Australian Studies Committee, Iain Davidson, Noreen Tuross, and Landon T. Clay for the invitation and support to participate in *Colonizing New Worlds*. The constructive reviews of this manuscript by Mim Dixon, Iain Davidson, Daryl Fedje, Michael Wilson, and an anonymous reviewer were very helpful and greatly appreciated. This manuscript was originally published in *Quaternary International* and is reprinted here with permission. Selected bibliographic references have been updated in this publication.



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# Chapter 13

## The Third Wave: The Results of the First Two International Meetings on Great Migrations and the Bronze Age Expansion Out of Southern Arabia

Olzhas Suleimenov

### 13.1 Introduction: The First Two Conferences and the First Two Waves

In the summer of 2008, the Conference on the first Great Migration, devoted to prehistoric migrations of humanity, took place in Paris. For the first time, scholars of geography, archeology, paleoanthropology, and genetics came together in the Parisian UNESCO building, Room XI. They presented their findings, and three points received unanimous approval:

1. Modern humans (*Homo sapiens*) as a species originated from a homeland in the equatorial part of East Africa. It is from there that different groups spread out all over the globe.
2. The first wave of migration occurred some 75,000–70,000 years ago, as attested to by genetic and archeological evidence found in Europe, Eurasia, southeast Asia, and Australia.
3. The second wave of migration occurred some 30,000–15,000 years ago. The evidence left by this wave, juxtaposed over and mixed with that left by the first wave, has been found in China and South America.

The issue of how such large distances were traversed was hardly ever raised at the conference since it was assumed that the migration occurred overland and land alone. However, it is important that we do not neglect the potential for seafaring by early modern humans during these great expansions. Short distances over water could have been covered by bamboo rafts or carved canoes. Thus, the 17,000 islands of Indonesia were populated in such a manner. Even more intriguing, Australia lies hundreds of nautical miles away from the closest islands of the Indonesian archipelago; yet, people somehow managed to reach this continent as early as ca. 40,000 years ago. While there is still some debate over the possibility of overland travel from southeast Asia. Geologists have argued that at no point in the past three million years did an overland bridge connected Australia to Asia (Flood 2003). As Flood (2003) notes, “There is no doubt that the first humans to settle in Australia arrived there by sea. We don’t know if that was intentional or by chance. Nor do we know what they had arrived on.”<sup>1</sup> The types of canoes and rafts the early European explorers saw the aborigines using during their first encounters therewith could not be used for long-distance open-ocean travel due to their light construction.

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Public figure, a published poet, and Ambassador of Kazakhstan to UNESCO (2001–2014)

<sup>1</sup> Translated from Russian by the author.

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It has been proposed in the past that modern humans may have originated in different parts of the world, in particular Australia. While this hypothesis was once contemplated by scholars, there is convincing evidence that humans arrived to Australia from Asia. The lack of any early remains of anthropoids or their descendants in Australia discredits any origin arguments for this continent, and human colonization clearly took place no more than 40,000 years ago.

Did ancient humans have watercraft capable of carrying enough people and the necessary supplies of food and water for a pioneering expedition through *maria incognita*, across open oceans, through potentially turbulent weather? Researchers are not presently in a position to answer this question. However, it is clear that several invasive species were introduced about 4,000 years ago (including dingoes, rats, and mice), which were presumably brought in accidentally by humans. Hence, four millennia ago there must have been a large ship with leftover vermin-infested food in its hold that reached the shores of Australia.

While the topic of human migration to the North American continent was a major theme in the Second Conference on Great Migrations, this topic was also raised at the First Conference. The North America migration, ca. 15,000 years ago via Beringia, was discussed, and the participants favored a land route, when the Bering land bridge still existed.

However, the remarkable divergence between the native cultures of North and South America enticingly challenges the idea that humans had first reached the northern part of the New World and then gradually spread southward to Central and South America, where, after many centuries of living in nomadic camps with scanty archeological evidence, they were suddenly struck by architectural genius that produced amazing cities and temples, such as terraced step pyramids similar to those found in Mesopotamia. In this chapter, I present an alternate explanation for the explosion of social complexity in Central and South America over the past few millennia. I suggest that a subsequent wave of migrants crossed the Pacific in boats millennia after the original people arrived in the Americas via the land bridge. This subsequent wave brought with it cultural traits from the Old World, sparking an increased complexity and further diversifying the cultures of the New World.

The data accumulated by archeologists over the past two centuries of study into ancient civilizations, dead languages, and long forgotten scripts makes it possible to begin considering a system of local migrations that made up the Third Global Wave spanning more recent time periods, such as the Bronze Age of six and fifth millennia BP.

Though arguments in support of the First and Second Waves of great migrations were based only on genetic and, to a lesser extent, archeological data, the Third Wave may be discussed using data and theory from such fields as paleogeography, linguistics, ethnography, and history of religion studies. This is why the discussion we started in Paris needed to be continued through the follow-up conference in New York (the topic of this volume). It is also quite symbolic that the Second Conference, dedicated to pre-Columbian America (the Second International Conference on the Great Migrations: Asia to America), is being held on the campus of Columbia University in New York. It is here that we can thoroughly discuss the two dominant hypotheses on how America might have been settled—whether by an inland ice-free corridor or by a Pacific coastal route. The discussion that took place in New York City is continued here in the scholarly press, with hope that the results thereof support the general topic of future meetings. The goal being to continue the conference series with such meetings taking place in China (settlement of southeast Asia and East Asia), Spain (settlement of Europe), Russia (settlement of northern Eurasia), and India (settlement of Central Asia). The issue of how the two prominent sedentary centers of civilization—Egypt and Mesopotamia (the Tigris–Euphrates River system)—will merit a separate discussion. It has also been envisaged that the final conference of the series may take place in Kenya where modern humans began their journey.

As planned, these discussions will result in the publication of the Great Migration Atlas and a collection of scholarly works that would systematize and update our base of knowledge on the evolution and spread of early humans.<sup>2</sup>

<sup>2</sup> The project was initiated by the Ministry of Foreign Affairs of the Republic of Kazakhstan, which also provided funding and logistical support for all the events thereunder. The conference was organized and hosted by the Permanent Delegation of the Republic of Kazakhstan to UNESCO and the Embassies of the Republic of Kazakhstan in the host countries.



## 13.2 Southern Arabia: Sumer

It is my opinion that the Third Wave originated early in the fifth millennium BP in two areas of the ancient world simultaneously, namely in the Mediterranean and the southern Arabian Peninsula. The Arabian migration—as I will refer to it—should be linked to exchange and expansion of trade networks. As noted by many archeologists, that particular area engaged in active trade with Mesopotamia, which at the time hosted sedentary societies with highly developed irrigated agriculture. The Mesopotamian economy was supported by the waters of the two most ample rivers of ancient West Asia, the Tigris and Euphrates Rivers, used to irrigate rich loess soils.

In southern Mesopotamia, the Sumerian civilization (ca. 7,500–4,500 BP) spanned the area from the Persian Gulf to modern day Baghdad. One may imagine that, over the centuries, that civilization had to endure many invasions and in the process absorbed numerous ethnic groups whose various languages and cultures enriched Sumerian society. It is quite possible that this receptive process of cultural assimilation made the Sumerian civilization the pinnacle of the Ancient World. It was there that the first symbolic scripts developed into regular syllabic cuneiform, suitable for government, economic, scientific, and artistic (such as epic literature) use. It is with Sumer and its clay tablets that the earliest documents of humanity’s “history” began. The tens and, even, hundreds of millennia of human/hominid existence that preceded the development of writing is our long “prehistoric” road.

The Bronze Age invasion of Mesopotamia by south Arabian nomads was different from typical nomadic raids; in this case, the newcomers from the perennially arid southern Arabia made the arable lands of northern Mesopotamia their home. According to Dyakonov, they settled Ur and Uruk, gave up their nomadic ways, and adopted writing and religion.

Although the Sumerian language was displaced by Semitic (Akkadian) languages, no physical displacement of one people by another occurred; the anthropological type... changed little, and the *Sumerian* culture was preserved almost in its entirety. In fact, the latter Babylonians were the same people as the Sumerians, albeit speaking a different language (Dyakonov 1963:37).<sup>3</sup>

Language defines a group of people. The expansion of peoples from southern Arabia north led to the displacement of the Sumerian language. As a result the Sumerian ethnic group is terminated at this point by archaeologists, yet the cultural dynamics of this region exploded in complexity and innovation—albeit under a different banner. This cultural expansion breathed life into the ancient Semitic empires of Akkad, Babylon, and Assyria. The cultural flow of the Third Wave carried the spark of this energy all over the world and lit the lights of new cultures, languages, writing systems, and trade around the globe.

“To date, no attempt to relate any other language to Sumerian had been successful,” noted Dyakonov (1963:37), the most renowned Soviet expert on dead languages. Nevertheless, in addition to “genetic kinship” of languages, it is high time to give proper recognition to their “cultural ties” which to various degrees permeated the majority of mainland (and, to a lesser extent, islander) languages whose paths repeatedly crossed in the course of their world travels. Had this concept been included in the comparativist lexicon, the Sumerian language would have been far less of an odd duck among both dead and currently used languages. Had this been the case, linguists observing affinity between words in other languages and Sumerian words would *not* need to prove the existence of “genetic kinship” or else give the linkage on the grounds of mere coincidence. As a concept, “genetic kinship of languages” is largely obsolete. “Cultural kinship” is a better way to think about the linkage between a language and the group of people that speaks it.

Thus, many lexicons contain words that correspond to Sumerian words both in form and semantics. Some lexicons may present no more than two or three such literal matches, while others may have dozens. These examples make it clear how great a distance the languages of Sumerian and old Semitic languages co-existed over, or over which Egyptian and the Mediterranean languages traveled.

<sup>3</sup> All Dyakonov (1963) quotes are translated by the author.

It is also likely that the attack on Sumer led to the displacement of a large part of its multiethnic populace, which was scattered to the four corners of the Old World. Venus worshipers (Sumerians and some of the future Europeans) headed northwest to seek patronage of their sacred star. Those adherent to the cult of the Rising Sun joined the flow of other Sun worshippers that had left the Mediterranean area earlier and gone eastward in search of the Sun's homeland. Both these routes are worthy of study; however, here we are more interested in the eastbound itinerary that reached the Pacific and, subsequently, the Americas.

### 13.3 Moon + Bull = God

The earliest of the epic literary sources began at the beginning, with the story of creation. The subject matter of the Great Migration is joined at the hip with the creation of modern humans (*Homo sapiens*) and their first beliefs, words, and writings. Moon worship was possibly the first religion ever. Only in the hot climate of equatorial Africa could the moon be revered—that cool celestial body reminiscent of the golden horns of the black buffalo (☾) that could only be seen in the pitch-black sky at night. The first moon priests used this symbol to denote not one but two concepts: (young) moon and bull. The buffalo, due to its sickle moon-like horns, was declared a sacred animal—the earthly reincarnation of the moon.

Through the centuries and millennia of black buffalo worship, the breed got domesticated. They were not killed, nor used for food; they were, instead, used as a role model, the Bull was revered as the progenitor figure and god on Earth.<sup>4</sup>

### 13.4 The Sun God

Migrating away from the equator, to North or South Africa, people learned to appreciate the warm celestial body that relieved the ever increasing cool of the night. Therefore, the sun surpassed the moon as the preeminent deity. The most sure-fire way for one god to usurp another is through murder. As a result of this cosmic murder, in literary form, the spear becomes the symbol for negation (whose function is still performed, to the present day in all writing systems, by crossing out a letter, a line or a page of text, we pierce it with a “spear”). Overthrowing the symbol of the moon, sun worshipping priests pierced the moon with a vertical spear from the top down (☿), or in some cases horizontally, thus killing both the moon and the bull. In response to this stellar/celestial homicide, rituals of this new faith called for sacrificing a bull the color of night (black bull) with a spear.



Tauromachy has survived until the present day in Spain where, it seems, it originated. It was there, in Stone Age caves, that the first sun worshipers found refuge. Now that we know the ideology behind sun symbolism (moon killed, death to the moon), we can discern the meaning of the symbolic combinations (“moon” and “spear”) that may still be found in the secret cave temples of Spain—such as, for




example, ☿☿☿. This symbol depicts the sun symbol in triplicate. Let us now try to read this inscription, which is at least 50,000 years old—as featured in 1,001 Words.<sup>5</sup> As the symbol of “moon killed=sun” resulted when these priests of this new faith rendered a sign for the sun or diurnal star the image of a simple circle was already assigned to the moon, so the priests introduced the deadly symbol






<sup>4</sup>For a more detailed discussion of the linkage between the moon and bull see Suleimenov (1998).

<sup>5</sup>1,001 Words (in Russian), a universal etymological dictionary that is currently being prepared for publication (by the author).

of the new faith. Two symbols were used to kill the moon: “spear” (line)——and “wound” (originally, a red dot)—.

Adopted repeatedly by additional tribes, the “wound” sign would eventually lose its original meaning and become a black dot. However, in some cases when rendered in one source or another, this hieroglyph would preserve the “wound” as a hole (.

Round and sickle-shaped objects that had been intentionally punctured or drilled through have been recovered from Paleolithic caves. These may be sun idols, which would eventually evolve into ornamentation and decoration; shells with holes in the middle would eventually be strung to form beads, necklaces, and coins with holes. These ornaments may have been initially deity symbols and good luck charms of the new religion. Now archeologists can help historians determine, at least with some degree of precision, the date sun worship was born—based on the age of the sickle-shaped objects with holes found in Paleolithic caves.

By way of killing the moon, one killed the bull, thus begetting the sun and the animals dedicated thereto (). Here, the spear wound would symbolize the death of the bull’s horns. Later on, these complex signs began to refer to hornless (female cows have no horns), small-horned (calves), and large-horned (ram or goat) animals. They were all deemed to be sacred reincarnations of the sun. This was precisely the attitude that facilitated taming and domestication of wild animals. The process of veneration meant that the animals were maintained instead of killing them for their meat. The creators of these first symbols used () for the full moon and the sun signs () while the “young moon” that looked like the horns was reserved for the “sun animal” signs (). However, this rule was not observed in some cultures. Thus, for example,  may stand for ram or sun god (Sumerian).

The hieroglyph “kill moon—bull” sanctioned the murder of cattle. Contaminating “bull + spear” = “sun” with “fire” led the priests to the fairly corporeal concept of “bull on a skewer in the fire.” Thus the ritual of making sacrifices to the sun-fire was born, i.e., a burned sacrifice or holocaust. It was probably the high priest who first tasted roast meat.

This tradition survived, and it is now the most respected elder around the table that gets the first taste. In Turkish, *tüday* means “of the food (taste) father,” i.e., father of the food, and thus *tamada* (*tamada*) appeared in Georgian as a master of feast ceremony. Apparently, this was how ritual meat eating, born through sun worship, came to be. Consequently, hunting big horned game was encouraged and eventually became an important economic component.

Eventually when sun worship was superseded by other religions, the priests of these new religions declared sun worship as paganism and ordered that the “sun” animals be sacrificed to please the new gods; thus the practice of leading sheep to the slaughter was started.

### 13.5 Major Milestones of the Third Wave

The sun symbols and their names became the names of gods, objects, peoples, places where they lived (countries, islands), and states. Therefore, tracing the trail of these names could help us identify the main directions and itineraries of the Third Wave. For that reason, it is important to study paleography, geography, and the information contained lexicons of the Old World. The very first attempt to assemble on one page one of the varied sun symbols helps us identify the primary direction in which the sun worshipers migrated from the Mediterranean to the Pacific and then on to South America across the ocean.

For example compare the following:



Ra, the “sun god” (ancient Egypt, fifth millennium BP)





(name unknown), the “sun” (ancient China, fourth millennium BP)










*kin* (kin, king), the “sun” (Maya, fourth millennium—first millennium BP)

It seems clear to me that these symbols originated in the same geographical area (Mediterranean) and share the same grammatical roots. It is also possible that the sign of the cross shares a similar root here.

The link between the cross and the radiant sun could have been made much earlier, had more scholarly attention been paid to the roots of the humanity's religions; the first creeds such as moon and sun worship, over the course of 3–4,000 years, sprang the offshoots of each and every world religion.

However, some sun symbols do not seem to match the pattern and may, therefore, be incorrect, such as the Sumerian sun  (*ud*) and  (*ja*)—also the *un* from a Turkic alphabet. Some priests may have construed the dot inside the circle and other subsequent priests drew vector rays from the dot. Later on, as the signage was adopted by other sun worshiping cultures, the “radiant sun” became a cross in script; thus, the rays consumed the dot.


This transformation of the dot to the cross must have happened in ancient West Asia as the round Sun symbol was introduced into Mesopotamia on the way from Egypt to Asia. Thus, in Sumerian hieroglyphics the sign of  *udu*—meaning sun god and also ram (fifth millennium BP) appears side by side with the angular *ud* symbol. It is quite likely that the dots and rays appeared at the same time and in the same region of the ancient world.

In Egypt and ancient West Asia, the sign of  suggested the idea of the wheel, swing mechanisms, and many other objects of material culture. In an effort to demonstrate to the Sun that their tribe was in fact worshipping the sacred star and thus merited its patronage, the priests insisted that settlements and cities be built in such a way as to make them look from above (i.e., from the god's perspective) as the sun symbol, such as   . The added “rays” were later on elaborated upon further in architecture; the center of the fenced-in territory would be reserved for the headquarters of the high priest, from which four roads or streets would lead outward (as early as in ancient Egyptian writing, the “city” is denoted with  or , as it is later for ancient Greek).


By that time, the dot in the Mediterranean region had already acquired the meaning of “god,” “sovereign,” or “king.” It was there and then that the name of the sun symbol in certain languages—king (*ing*, *ink*)—acquired that additional meaning. The Aztecs of South America would only preserve the word for king (*ink*) from it. The ancestors of modern day English adopted the word “king” from that time and place. Once again, it was only the Maya who stuck to the primary meaning of the word king (*kin*, *kin*), i.e., the sun, and would not let the rays devour the dot.

### 13.6 Maya and the Turkmens

The very name of the Mayan sun symbol, *kin* (king, kin), makes it easy to compare to Turkic *kün*—sun or day (*cuman*, *karluk*); *kön*, that very same word in Tatar; *kin*—day (*Karaim*); *gün*—day, *güneş*—sun in Turkish, Azerbaijani. Should one allow for such a comparison, then the Inca word *kon* (sun) may be restored to its original form, *\*kön*, that was lost when Spanish monks, recording Incan words could not render the artificially soft sound using the Latin alphabet.

Additionally, comparing the Mayan and Turkic vocabulary may help restore the lost sun symbol in the hieroglyphics that the Turkic people lost. In all likelihood, the window in the spherical roof of the Turkic yurt was also modeled after the sun. Made from specially treated wood, it remains unchanged to this day and resembles .


Upon closer inspection, it becomes apparent that first in Eurasia and now all over the world the sun symbol, with its inscribed cross served as a prototype for the window, the conduit for sunlight to enter the home. Originally, windows in temples and dwellings were located in the center of a domed roof and only then shifted down to the walls. It would not be hard to link the ancient names for windows to words that meant sun, fire, or light.


The shape of windows in Eurasia proves again that it was not in South America that the “dot inside the sun” symbol acquired its rays; it first happened in the Mediterranean region and Mesopotamia, i.e., like this: . The Maya carried this “dot of rays” across the Eurasian supercontinent and all the way to the new one overseas.



On the way eastward from the Mediterranean and ancient West Asia, sun worshippers modeled their Wheel, Window, and City after the sacred symbol. It appears that on their way to the Pacific the Maya did in fact come across a sun worshiping Turk or two.

### 13.7 The Power of Euphemism

Having first appeared in the Paleolithic, the sign of the “moon killed” (circle with a red dot inside) would survive until Egypt. As ancient Egypt expanded geographically, they caused some Mediterranean people, whose priests had a different take on the sun ideology, to migrate eastward. The difference in ideologies is confirmed by the fact that the sign was known under different names.

I will not go into detail on how the name of the ancient Egyptian hieroglyph , Ra, (sun god) came into being. What is important to know is that there had been a tradition of making the sacred name taboo, which called for the use of euphemisms. This may still be evident in the customs and traditions of many ethnic groups.

Because of the existing taboo, all the variants of the dot (line) in  may have had emotionally and semantically neutral names of a descriptive nature. Thus, the “hole in the moon” would become a “young sun,” or the “child of the moon” would be equated with the “young sun.”

These names have been preserved in the Mayan language. In addition to the sun hieroglyph , *kin* (king, kin), at some point this culture must have had a fairly material sun symbol in its sign system, in the form of a stone disk with a hole, , that was called *paal u*, where *paal* meant (1) “child” or (2) “hole” and *u*—“moon” or “young moon” (Knorozov 1963:199). This is not a random combination of words since the dictionary contains both words as separate entries and *paal u* as a set phrase meaning “new moon.” Apparently, the meaning of this set phrase that has existed since the ancient times changed at some point, possibly due to the loss of the old symbolic object in the material culture. Yet there was a time when this sign, prior to losing its original sense of “young sun” > “new sun,” led them eastward, in search of the land of the rising sun.

It is easier to argue that the eastward-bound Great Migration from the Mediterranean world and Mesopotamia left a trail of ideological beliefs, than it is to argue that the cult of the day star was born over and over again ad infinitum; the roots of this faith were strong enough to survive over millennia.

Once the “child of the moon” (“young sun”) euphemism lost its primary meaning and evolved into a fairly insignificant “new moon,” the priests, it seems to me, were compelled to clarify this confusing semantics by way of introducing an unambiguous name for the chief deity—*jaš kin*—meaning “new sun” or “new day.” While still back there, on that other shore of the Pacific, the Maya might have come across the Turkmen and shared their faith. Hence, the word *jaš* meaning (1) “youthful” or “young”; (2) “green”; or (3) “spring” (Old Turkic) must have been borrowed. In the Mayan vocabulary, only two meanings were preserved; additionally, one of them underwent a shift from “young” to “new.” In the [Old] Turkic language, the change of religion caused the set phrase *jaš kün* (“young sun”) to fall apart. The words do exist in the language separately but can only come together by chance or in figurative language. In the Mayan language, *jaš kin* (“new sun”) remained a set phrase since their religion never changed. That’s what they began calling their god—now directly and without any poetic kinks.

Oghuz Turks must have borrowed the name of the special case and used it to denote the general: \**jaš gün*—“new sun” > “sun.” Then, by virtue of linguistic inversion it became \**gün jaš* > *güneš*—“sun”

(Turkish, Azerbaijani). The Incas called their supreme god differently—*kon tiki* (“descendant of the sun”). Now, it seems, we have restored the soft vowel in *\*kōn* based on the soft version in corresponding Mayan and Turkic words.

In all likelihood, *tiki*, meaning descendant in the Inca language (Quechua), is related to *tek* (“kin,” “tribe”) that is found in many Amerindian languages—judging by its use in ethnonyms, such as Huastec, Jacaltec, Chicomuceltec, Aguateca, and Uspanteca. The name that is best known from literature is the Aztecs—“kin of the stork.” This word was preserved in some Turkic languages as well. Consider Kazakh *tek*—“kin,” *tekti*—“wellborn,” *tegi*—“his kin,” etc. Kazakhs call the *bashkirs ište*k, “domestic (inner) kin.” In Siberia, Russian pioneers came across a people called the Ostyaks.

Now let us look at some ancient Turkic sources: *tegin*—“descendant”; *kül-tegin*—name of the first khagan derived from *\*kün-tegin*—“descendant of the sun.”

### 13.8 The Sun, the Child of the Moon

The etymological family of this Third Wave is taking shape, symbols, names, and meanings. *Paal u* ☉ means child of the moon or hole of the moon. The original figurative meaning, young sun, was lost. The set phrase was then construed as “child-moon” and resulted in the new meaning, young moon or new moon.

Disagreements between the priests on how to interpret the crimson dot (hole) in the sacred symbol of Ra split the Mediterranean world into two irreconcilable camps. Although, understanding of the crimson dot as the little sun or child sun was common for everyone.

Some tribes developed this into “child of the sun” and began calling the high priests (or kings) by that title. However, those who knew that the “big circle” wasn’t the sun but rather the moon believed that, of course, the little crimson sun-child in the womb (middle of the symbol) of the moon was the child of the moon.

Therefore, in a metaphoric sense, we can envision the Third Wave to eventually reach the Americas, such as the Maya, Aztecs, Incas, Olmecs, and others reached the New World, to have done so while in search of the home of the sun, the land where it rises. Their descendants continued this eastbound quest through the jungle and across the mountains until they reached the Atlantic.

In 1994, in Washington, DC, I happened upon a photography exhibition called “The Coins of Palau.” The ancient “coins” from this island are stone disks some as big as three meters in diameter, each with a hole in the middle: ☉. The exhibition organizers suggested that the holes drilled into the stone to make them easier to carry. The show’s guide, noted that the stones were currency, despite the fact that the island sits thousands of kilometers away from the mainland, and it is unclear what the currency could purchase, except for fish from the sea and fruit from the palm.<sup>6</sup>


I pose the possibility that they are sun idols; they were carved out of limestone, placed flat on their sides or backs or installed upright all over the island so that the divine star could see the sign. Upon seeing them on the island, the stellar deity would recognize the people as devout worshipers and protect them from hunger, cold, and hurricanes.

Apparently, in view of the existing taboo, the sacred symbol that had brought them there was called *Pala-u* (child of the moon or young sun). It also gave the new land its name, the island of Palau. Over time, the name of this island was slowly morphed into *\*Bel-u*. The current population on the island remembers both names given to their homeland, and they say the second name with certain reverence for the first, hence, Belau.

<sup>6</sup>“For easier carry.” This is also the explanation given in China about the holes in the middle of their coins. “Carries easily on a shoelace.” So it appears that the dinars at that museum in Egypt have the holes for the same reason. The holes in beads were also made to thread a line.




At the recent 36th Session of UNESCO's General Conference, I met with the President of the island nation of Palau (Belau), Johnson Toribiong, and the island nation's Minister of Culture, Faustina K. Rehuher Marugg. Ms. Marugg believes that the stone disks with holes are "old coins"—if the biggest and heaviest ones in the world. However, my question as to what these coins could buy was left unanswered.

The fact that there is an island in the Pacific with a name whose structure and meaning can be clarified using Mayan vocabulary speaks to the proposition that the Maya had reached America from southeast Asia by sea. It is also plausible that in addition to the Maya others had also preserved their memories of the sacred symbol and used it to name their new homeland. Apparently, there had been plenty of names—as many as of the tribes themselves, perhaps. The island that lies the closest to South America (2,500 miles off the coast of Chile)—the "Easter Island"—isn't called that by the locals, of course. They refer to it as the "navel of the world" or "eyes looking to the sky." People that reached that speck of land may have derived its name from the dot-in-a-circle symbol——that became its emblem and was, possibly, made of whatever materials available and laid out all over the grounds in great numbers. Hence the "eyes." The priests may have passed on the knowledge of it being a euphemistic stand-in for the image of god, the young sun.

## 13.9 Discussion: The ũ Era

### 13.9.1 I

Names of moon symbols () that became part of all the known symbols for the sun and sun animals (cow, ram, calf, buffalo) in ancient scripts should be recognized as one of the most important linguistic markers outlining the routes of the Third Wave of migration. While the word ũ or ũŋ, meaning moon, is now gone from all Eurasian languages; however, it is preserved in compound names, such as the names for the sun, royal titles, or country names. A linguist can follow these footprints like a tracker. Thus, knowing the corresponding inner and outer inflexions we may equate the following word forms: *bal-a=bel*; *par-a=per* (or *bal-a=baal*; *par-a=paar*).

We know the original meanings of only some of these vernacular roots, *bala* is child (in ancient Indian); *bala*, *pala* (in Turkic); *paal* (in Mayan); *ber* is son (in Aramaic). Other forms could have resulted from natural phonetic shifts while preserving their meaning of child or son.

We believe that the first set phrase that came from the Mayan language—*paal u* (new moon), which literally translates to "child of the moon" or "hole of the moon" is dialectally related to the name of the Pacific island Palau.

There are ethnicities in southeast Asia whose local names for themselves may have originated in the same group, in that they derive from old names for the same sacred symbol. Thus, there is an ethnic group in the mountains of Burma, with roughly 400,000 members, called Palaung (\**Pala-uŋ*). "These are the oldest inhabitants of Northern Indochina" (EPRW 2000:405). Yet another small group (about 35,000 people), called Palawan (\**Pala-ũŋ*) lives on an eponymous island in the Philippine Archipelago. It would be quite interesting to compare the vocabularies and cultures of these peoples with those of the Palau and the Maya.

### 13.9.2 II

I believe that the cultures of ancient West Asia in the fifth and fourth millennia BP were familiar with such compound terms including this presumed name of the moon, ũ (*ũŋ*).




“Balu or, subsequently, Baal (general Semitic b'l—literally, “Owner” or “Master”), is most commonly used as a reference to gods in West Semitic mythology. The cult of Balu—the god of storms, thunder, lightning and rain—had been among the most widespread. Balu is Ilu's son. Emerging victorious in the struggle of the younger generation of gods for power over the world and the gods, he had pushed Ilu aside and become the de facto master of the universe.” (MW 1987:159)

The first part of the word *Ilu* is known in all Semitic languages: ancient Semitic *el, il* (god); Hebrew *el, il* (god); Phoenician *l; il* (Ugaritic). The second part, -u, had been long lost. Only now, extrapolating from Mayan vocabulary, one may hypothesize that this is in fact \*u, the moon. It follows then that \*il-u, the moon god, was the first deity of ancient Semites and the father of the next god, \*Baal-u—son of the moon—i.e., if we are to restore this semantic chain, the god of the rising sun. Thus, the shift from moon to sun worshipping in ancient Semitic mythology appears to have taken the evolutionary, rather than revolutionary. Indeed, Baalu does not kill his father Ilu who the Semites continue to honor as their old god.


With moon worshipping going away, Baalu contracted to Baal while preserving its original figurative meaning of “master,” “god,” or “chief god.” Very quickly, in Akkadian texts, it becomes Bel—the “chief god” or simply “god.” This may explain the following equations: \*Baal-u = \*Bel-u is child of the moon. Here's the etymology in Semitic languages: *ben*, meaning son in ancient Semitic and Hebrew; *ibn* means son in Arabic; \**bel* or *ber* is son in Aramaic. The “NLR Law” that explains the shift away from the nasal consonant doesn't allow for ben to morph into ber bypassing the intermediate \**bel*.


However, that intermediate variant must have developed at the time when it was actively used by the priests as part of their religious term base—which excluded it from everyday use by the laity. This may just be the reason why we can't find it in any Semitic vocabulary. However, it could have been preserved in other languages, such as, for example, Latin: \**fil* is child as in *filius* for son and *filia* for daughter.

### 13.9.3 III

Consider Mediterranean root *pero*, or pharaoh in ancient Egyptian or *farao*, in ancient Greek. The pharaoh in Egypt was considered to be a god, so the hieroglyph for pharaoh shouldn't be far removed from that of the sun. We know why the sun symbol with the wound,  or , is semantically equivalent to that with the spear () . The variants might have been both called Ra, while a euphemism would be used for the tabooed dot (as well as the line): \**Para-u* = \**Per-u*, i.e., the child of the moon.

### 13.9.4 IV

The circle with a dot (small circle) inside becomes a symbol of the settlement and subsequently county, city, and state. The name could be assigned to countries and peoples. In turn, the circle with a line (sun with a ray) was the symbol of earthly power. A ray is a child of the star. The king is but a reincarnation of the ray on Earth. Material symbols of power had also been modeled after  . Thus, Assyrian elucidators had expressed themselves in a fairly visual fashion: the Assyrian king holds a ring (symbol of the region or nation) and a stick (symbol of force).

The priests gave other dignitaries in the hierarchy a host of other objects whose symbolic connection is not as clear-cut: mace head, labrys, hammer, or walking staff with a knob. These imaginative priests produced a number of other solutions for  as well, such as (1) shaven head with a braided lock of hair starting at the crown, the kind of hairstyle common for Chinese rulers or (2) braided goatee of the gods and pharaohs in ancient Egypt.

### 13.9.5 V

The priests saved a variant of the sun symbol for their own use as well—a shaven or plucked-out circle on top of the head (☉). This long-term practice became a genetic memory. Today, an early bald spot may signify one may have had priests in his lineage. The color of that dot also mattered. Thus, the black yarmulke atop one's head must have denoted lower-rank priests (☉) while the red one was reserved for the top brass. Catholic cardinals always wear red zucchetos (skullcaps) as well.

### 13.9.6 VI

Therefore, the following etymological family may be reconstructed: *per-o* for pharaoh (\**per-û*; *per-îŋ*). Early Slavic and Baltic peoples were familiar with this symbol and its name variants, such as Perun the “thunder and lightning god” in Slavic tradition. He is semantically related to \*Bālu, the, “thunder, lightning, and rain god” in Old Semitic, Mesopotamia mythology. People from the Baltic region pronounced (and possibly wrote) these separately, as two syllables with a glottal stop in between: \*Per-cun > Percunas, the “thunder and lightning god.”

However, not all Slavic people recognized divinity in the pharaonic symbol. In some languages, it was simply used as a glyph for cloud and thunder, such as in the Serbian *perun* that means lightning. In eastern Slavic syntax, the pharaoh sign was used as the word for feather, something that almost looked like the symbol, ☿, *per-o*. These examples illustrate word formation mechanisms that so far have remained unknown to scholars and at the same time indicate that many peoples in deep antiquity originally used these glyphs.

### 13.9.7 VII

One of the tribes that was inspired by the sign of ☉☉ \**per-û* reached the Americas and honored what they thought was the homeland of the young sun by calling it Peru. The glyphs ☿☿ were used in all complexes of symbols for the sun and sun animals that were created millennia ago. These symbols are found in Sumerian and Chinese writings, and their names continue to live in modern languages helping us restore the long-forgotten hieroglyphs.


The old Phoenician alphabet had no letters to denote vowels, only consonants. The Greek and Latin alphabets borrowed the letters “o” and “u” from some unknown hieroglyphic scripts of the Mediterranean where they had been preserved as relics of the Mayan era. Latin grammarians separated the variants of the complex labial vowel ū using ☿ and ▼, i.e., “u” and ○—“o” (early Latin) that later became ☿—“u” and ▼—“v.” However, these letters were not simply invented by Greek or Latin speakers, they were derived from the Sumerian hieroglyph ☿—“u,” the Old Persian letter ☿—“u,” and the Old Turkic letter ☿—“u (o).” Historical linguists have not yet tried to compare those signs to Greek or Latin letters; likely due to the widely accepted belief that these people are not historical or cultural related. It doesn't help that the signs are oriented differently. The Greco-Latin version uses the same variant as southern African for the sickle moon while Asian and Sumerian writings prefer its northern variant.

In addition to the cultures of Egypt and ancient West Asia, traces of the Maya may be found in India, China, and Indonesia. I believe that it is no coincidence that the name of the Great Buddha's mother was Maya.

## 13.10 Conclusion

To conclude, one may posit that the Third Wave hypothesis of the Great Migration across the Pacific to Central and South America will need additional supporting evidence from such fields of study as linguistics, ethnography, history of religion, and architecture. Such evidence will play an even greater role than genetic or archeological data since it will be from the time of the earliest recorded history when great cultures and civilizations arose and created regular writing systems.

For example, we believe it would be very important to trace the worldwide propagation of words deriving from the ancient Egyptian symbol of Ra (\*Rû), the sun god. Different peoples had names for the red dot (hole) in the early literary periods in the Mediterranean; these writing systems all shared the general rule of hieroglyphic grammar whereas details of the complex symbol would be assigned the general name of the whole with a negative affix added. The following negative affixes may be found in the Mediterranean languages of the time: (1) *ha* \*(*a-wa-ba-pa*)—spear; (2) *j* (*dž'-di-ti*)—arrow; and (3) *n* (no, *na*, *ne*, *ni*).

The new symbolic etymology is posed to help linguists make many surprising discoveries about the mysterious origins of words. Thus, researchers studying Slavic languages may be interested to know if the dot in , Ra, bears any relation to (1) *Ra-na* (wound), (2) *Ra-no* (early), (3) *Ra-ni* (early mornings), etc.

The words *рано* ([rahno], early), *рань* ([rahn'], early morning), and *рана* ([rahnah], wound) came into Russian from a number of dialects (compare with Czech and Ukrainian for “morning” (*rano* and *ranok* respectively)). A language where the negative prefix is used prepositionally to produce \**no-Ra*—*нора* ([norah], hole, burrow). In all likelihood, it is the hole in the material [symbolic] object that is meant here. The name for the dot (hole)—*Ra-j*; *Ra-ha* (*Ra-wa*)—underwent similar transformations in other cultures as well.

Additionally, one needs to consider the changes that may have occurred on the way to the Pacific islands. Thus, the name the peoples of Palau Island (Belau) call their stone circles (coins) *Rai*. The word has no other meaning whatsoever; however, a new meaning may thereof be uncovered in the course of the Great Migration research project.

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